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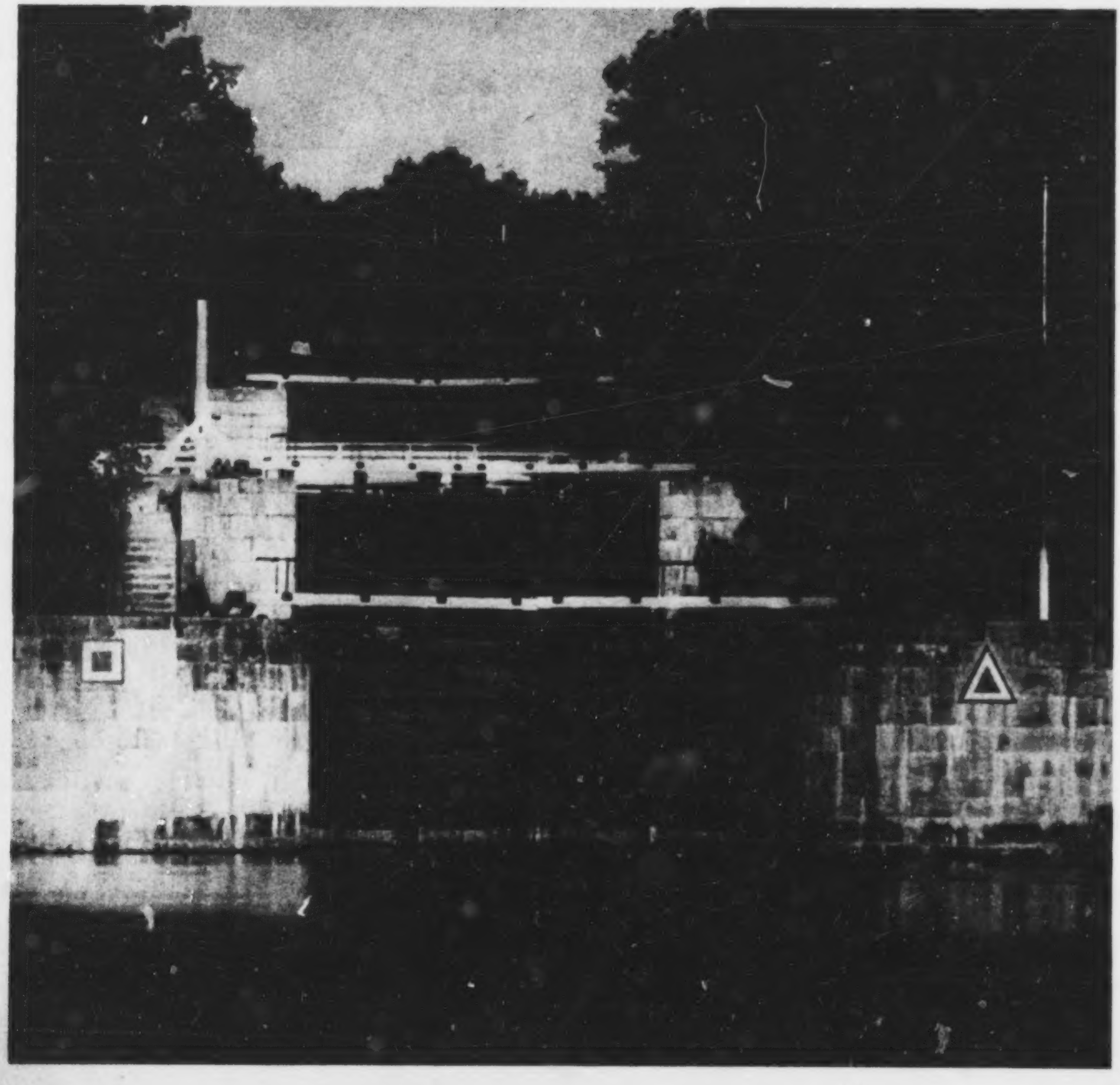

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The Canals of Canada,
by John P. Heisler

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Cover:
The locks at Jones Falls, Rideau Canal.
(Photo courtesy of W. A. Current.)

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The Canals of Canada

by John P. Heisler

Abstract

Canals have played an important part in the economic and social development of Canada. Undertaken but never completed during the French regime, they were begun soon after 1760 and reached the peak of their development and use during the mid-19th century. The financing and construction of canals to improve navigation on the St. Lawrence and the Great Lakes; the Rideau Canal constituting a waterway between the Ottawa and the St. Lawrence, and the canals communicating with the American waterway system of New York state are discussed in detail. Several waterways were proposed and some actually constructed in the Maritimes and in the West. Part of this deep waterway system culminated in the St. Lawrence Seaway, a successful venture in international cooperation.

Introduction

The development of transportation and communication is one of the epic and continuing themes in Canadian history. Any account of it must depict man's conquest over nature – of his attempt to survive in an area of vast distances, small population and few goods. Such an account must also show the economic, political and social considerations, along with imperial and foreign relations, which influenced this development. In this work it is intended to consider but one aspect of this vast theme; the significant role played by canals in the development of transportation and communication in Canada. Such development was in response to the challenge posed from the beginning of Canadian civilization by the critical problems of time and space. Such development also determined the creation of a viable society in Canada.

I

From the earliest times rivers have been the veins of any political or economic area. Man depended upon rivers for food, power and transport. By themselves, however, rivers were not always able to serve fully the needs of man. Hence canals were dug and used to tame the river, to irrigate the land and to improve inland navigation. The early canals in Egypt, Babylonia and China were probably built for drainage or irrigation and the use of these ditches for transportation may have been accidental. However, with economic growth and political expansion, better waterways were built to facilitate commerce and increase the power of emerging empires. We know how the Egyptians were obsessed with canal building and how the Egyptian ruler Sesostris III built a canal 200 feet long by 75 feet wide and 26 feet deep for the express purpose of providing a direct waterway for the conquest of Nubia. Herodotus described how the whole of Assyria was interlaced with canals. Nebuchadnezzar, the ruler of the resurgent Babylonian Empire, restored canals in the Fertile Crescent about 600 B.C. and, through good water management, there developed a thriving pastoral and agrarian economy in this area. Sometime later in 510 B.C. Darius the Great proposed the rebuilding of the Nelo-Red Sea canal, the historical origins of which are lost, linking the Mediterranean Sea and the Indian Ocean. Chinese history mentions a system of waterways which became the Grand Canal of China as early as the 6th century B.C. The Grand Canal is thought to have been 600 miles long by the 8th century, and it is usually believed that this canal was completed by the ruler Kublai Khan in the 13th century.

The Greek city states, deeply involved in commerce, appreciated the value of canals in maritime trade by maintaining the Levkás Canal, originally cut in 640 B.C. to separate the peninsula of Levkás from the mainland, and by their attempts to cut through the Isthmus of Corinth. Later, the Romans were, from the beginning of their history, great canal builders. At first they constructed canals when draining vast marshlands. After a time, however, Rome devoted all its engineering skill to the problem of canal building when faced with tremendous problems of communication. In Gaul, the Fossa Mariana improved navigation from the Rhône River to the Mediterranean (102 B.C.). In Britain, the Exe River was canalized and the Fosse Dyke was built from the Trent River to Lincoln on the Wetham River. In Egypt and North Africa the Romans used careful water management to reclaim miles of desert. Rome's decline in strong administration and efficiency coincided with a decay of her irrigation and navigation canals.

During the Middle Ages, following the collapse of Roman authority, a harrassed and politically decentralized Europe still retained an interest in artificial waterways. In the 5th century a navigable channel was built from Mentone, near Ravenna, to the sea. In the 12th century, Henry I of England reputedly deepened the Fosse Dyke. With the revival of trade after the year 1000, the Low Countries were a natural centre for the development of waterways and in medieval Spain the Moors built canals in Granada.

The mercantile era which followed the Renaissance in European history witnessed an increasing interest in canals. This was the period of the emerging centralized national state, the commercial revolution and the expansion of Europe overseas. All these movements and events contributed to a revival of canal construction. Elizabethan England built the well-known Exeter Canal between 1564 and 1566. The France of Louis XIV built the Languedoc Canal, which connected the Bay of Biscay with the Mediterranean and was regarded as the pioneer of canals of modern Europe. Seventeenth-century England made some progress in rendering some of the larger rivers navigable but did little in constructing canals until the middle of the 18th century. Then in 1759, the Duke of Bridgewater obtained a charter to construct a canal between Manchester and his collieries at Worsley and this was opened for traffic two years later. The event heralded a period of great activity in canal construction.

II

It seems likely that from the very beginning of his existence in North America the white man thought about canals; the Atlantic coastline, deeply indented with rivers flowing to the sea, would suggest waterways, natural and artificial. Indeed, scarcely had a permanent foothold been gained on the new continent before Miles Standish in 1623, while in charge of the New Plymouth defenses, "dreamed of cutting a canal through the Isthmus of Cape Cod" thereby allowing the English to reach the Dutch for trading at the head of Buzzards Bay. Later in 1680, August Hemen, Lord of Bohemia Manor, considered seriously "the construction of a canal to connect the Delaware and Chesapeake bays."[1] In the 18th century Cadwallader Colden, surveyor of the Province of New York, realized in 1724 that a canal could be dug between the Hudson River at Albany and Lake Erie at Buffalo. When finally constructed 100 years later, this 360-mile canal contributed more than anything else toward making New York the most powerful state in the American union. In the period of the American Revolution, Benjamin Franklin became interested in the possibility of a complicated canal system which would bring wealth to Philadelphia: in particular a Susquehanna-Schuylkill canal. At the same time George Washington considered the feasibility of joining the Potomac and Ohio rivers, thereby binding the hinterland to the coastal regions. Though little came of these dreams, they do indicate man's preoccupation with the problems of time and space and his probable response to them.

III

Before proceeding to treat in detail the subject of Canadian canals, brief mention might be made here of the principal routes of Canadian inland navigation at the time of confederation; namely, the St. Lawrence navigation, the Montreal-Kingston route via the Ottawa River, and the Richelieu and Lake Champlain navigation, along with canals designed to overcome the natural obstacles located on these routes.

Along the St. Lawrence navigation, extending from the Strait of Belle Isle to Fond du Lac at the head of Lake Superior, were located the Lachine, the Beauharnois, the Cornwall, the Williamsburg and the Welland canals. The total distance of this navigation was 2,384 statute miles and the total length of the canals along this route was 70-83/100 miles with a total lockage of 536½ feet through 54 locks. Also located along the St. Lawrence navigation was the Sault Ste. Marie Canal constructed to avoid the St. Marys Falls and Rapids. This canal, located on the American side of the river, united Lake Huron and Lake Superior, thereby opening navigation to the west end of Lake Superior.

Up the St. Lawrence as far as Lake St. Peter there was a navigable channel for all vessels until, toward the middle of the 19th century, dredging had to be done in parts of the lake to enable large ocean vessels to reach Montreal. Immediately above Montreal were the St. Louis Rapids, the necessity of surmounting which gave rise to the construction of the Lachine Canal. This canal located on the island of Montreal was 8½ miles long and extended from the city to the village of Lachine. It was opened in August, 1824. Next came the Beauharnois Canal, a distance of 15¼ miles from the Lachine across Lake St.

Louis. This canal was situated on the south side of the St. Lawrence and did not follow the bank of the river but ran some distance inland. It connected Lake St. Louis with Lake St. Francis and extended for 11¼ miles. Within its length the Beauharnois overcame three rapids: the first met with in ascending the river was called "The Cascades," the second "The Cedars" and the third "The Coteau." These rapids themselves only occupied a length of about 7 miles and the two intervening spaces were easily navigated. Previous to the construction of the Beauharnois Canal, which was opened in August, 1845, the navigation between Lake St. Louis and Lake St. Francis was effected for many years by means of four short canals. Three of these were built to avoid the Cascades and were located on the north side of the St. Lawrence at the "Faucelle," the "Trou du Moulin" and at "Split Rock." The next canal in ascending the St. Lawrence was the Cornwall Canal, completed in 1843. Its distance from the head of the Beauharnois Canal through Lake St. Francis was 32¾ miles. This canal, which overcame the Long Sault Rapids, was 11¾ miles long and followed the northern shore of the St. Lawrence. Next were the three small canals of Farran's Point, the Rapide Plat and the Galops, known collectively as the Williamsburg Canals. The distance from the head of the Cornwall Canal to the foot of the Farran's Point Canal was 5 miles. The canal, which was three-fourths of a mile long, extended from the foot to the head of the rapids at Farran's Point and lay on the north side of the river. Completed in October, 1847, it was used principally by vessels ascending the river while descending vessels avoided the canal, running the rapids safely. From the head of Farran's Point Canal to the foot of the Rapide Plat Canal was a distance of 10½ miles. This canal, located on the north shore, overcame the Rapide Plat rapids and was 5 miles long. It was opened to traffic in 1846. Four and one-half miles farther up the St. Lawrence was the Galops Canal opened in November, 1846, extending for 7⅝ miles on the north side of the river and avoiding the rapids at Iroquois Point, Point Cardinal and the Galops.

The distance from the head of the Galops Canal following the channel of the St. Lawrence and through Lake Ontario to Port Dalhousie, at the foot of the Welland Canal, was 236⅜ miles. This canal was constructed to avoid the most formidable obstacle of them all – the falls of Niagara. The main line of the Welland extended from Port Dalhousie on Lake Ontario to Port Colborne on Lake Erie, a distance of 27½ miles, and was completed in March, 1833. From Port Colborne on Lake Erie to the entrance of Lake Superior, no impediment to navigation occurred. But on the St. Marys River, guarding the entrance to the largest of the Great Lakes, are the St. Marys Falls and Rapids. Here is the last of the obstructions to the navigation on the St. Lawrence system and here, too, was built, by the Americans in 1855, the last canal necessary to open navigation to the head of the system at the west end of Lake Superior. Finally, in concluding this brief description of the St. Lawrence navigation mention might be made of the Burlington Bay Canal, completed in 1832, a branch of the main line of this navigation enabling vessels to reach Hamilton.

The second line of navigation extended from Montreal to Kingston, passing up the Ottawa River as far as the town of Ottawa. The distance between Montreal and Kingston by this line was 241½ miles. The canals on this route, after leaving the Lachine, were Ste. Anne (known as the Ste. Anne Lock), the Carillon, the Chute-à-Blondeau, the Grenville and the Rideau. The united length of these canals was 142⅞ miles, including the Lachine Canal, and the lockage in going from Montreal to Kingston was 578¼ feet (i.e., 401¼ feet rise and 177 feet fall, during seasons of high water). Flowing from the northwest, the Ottawa River was divided into four distinct channels at its junction with the St. Lawrence by a cluster of large islands. These in order of size were the island of Montreal, Ile-Jésus and Ile-Perrot. Two of the channels flowed on either side of Ile-Perrot, which lay between Vaudreuil and the head of the island of Montreal and discharged into the expansion of the St. Lawrence called Lake St. Louis. The two other channels were formed by Ile-Jésus, lying north of the island of Montreal, and joined the St. Lawrence at the foot of these islands. Immediately before passing into the St. Lawrence through these four channels, the Ottawa River spread out into a wide space called the Lake of Two Mountains. Here the waters were about three feet higher than the waters of Lake St. Louis. Hence the waters running through the two channels round Ile-Perrot had considerable force and formed a succession of small rapids. In the channel running between Ile-Perrot and the head of the island of Montreal the rapid was opposite the village of Ste. Anne and the Ste. Anne Lock was designed to overcome this rapid. The works, completed in June, 1843, were ⅛-mile long. From the head of the Lachine Canal through Lake St. Louis to the lock of Ste. Anne was 15 miles. Proceeding from the lock at Ste. Anne through the Lake of Two Mountains and up the Ottawa River for a short distance, one reached the Ordnance or Military Canals. These canals, comprising the Carillon, the Chute-à-Blondeau, the Grenville and the Rideau, were constructed by the imperial government before 1832 and for years afterwards were managed by imperial authority. From the lock at Ste. Anne to the foot of the Carillon following the line of navigation was 27 miles. This canal, which overcame the Carillon rapids, was constructed on the northern bank of the foot of the river and was 2⅛ miles long. The distance from the head of the Carillon Canal to the foot of the Chute-à-Blondeau was 4 miles. This canal also lay on the north side of the river and avoided the Chute-à-Blondeau. One-eighth of a mile in length, it cut through solid rock. Nearly one and one-half miles separated the head of Chute-à-Blondeau Canal and the foot of the Grenville Canal. Again lying on the north shore of the river, this canal was 5¾ miles long and carried navigation round the Long Sault Rapids. Above Grenville, at the head of the Grenville Canal, the Ottawa River was navigable for a distance of 56 miles to Ottawa. The Rideau Canal commencing at Ottawa and terminating at Kingston, at the foot of Lake Ontario, connected the Ottawa River and the St. Lawrence and lakes. From Montreal to Ottawa by water was 120 miles; from Montreal to Kingston by the St. Lawrence was 178 miles and from Ottawa to Kingston by the Rideau Canal was 126¼ miles. Constructed for military purposes, the Rideau might also be called the Rideau and Cataraqui navigation since it consisted in the conversion of the Rideau and Cataraqui rivers into a continuous navigable channel.

Draining an area of 1,550 square miles the Rideau River discharged over a perpendicular falls of about 45 feet into the Ottawa. This falls necessitated an artificial entrance to its waters by canal in order to connect it with the Ottawa River for navigation. The Cataraqui, drawing a basin of 200 square miles, emptied into the St. Lawrence at Kingston. Extending along the waterway from Ottawa to Kingston was a series of 24 dams elevating the waters. There were also waste and regulating weirs. The whole length of the short canals not including the locks was 16½ miles. Finally, the River Tay, on which is situated the town of Perth, about 7 miles from the river mouth, might be considered as a branch of the Rideau falling into the Rideau at the foot of Lower Rideau Lake.

The third line of navigation was designed with a view to placing the St. Lawrence in communication with Lake Champlain and the American system of canals which led to the Hudson River and New York City. Boats leaving Canadian waters for New York or intermediate ports on this line entered the mouth of the Richelieu River at Sorel, on the St. Lawrence, 46 miles below Montreal. From Sorel boats ascended the Richelieu for 14 miles to St. Ours where they were lifted 5 feet. Here the lock and dam retained the waters of the river thereby giving a depth of not less than 7 feet as far as the lower entrance of the Chambly Canal located 32 miles further up the Richelieu at the village of Chambly. This canal, constructed to avoid the Chambly Rapids, was an extension of the navigation afforded by the St. Ours dam. It ran from the Chambly basin up to St. John, a town 12 miles farther up the river. In the space of these 12 miles the boats were raised 74 feet by lockage. After traversing the Richelieu for another 27 miles the boats arrived at the Canadian frontier which was at a line crossing the outlet of Lake Champlain. Navigating the entire length of Lake Champlain the boats then entered the Champlain Canal, an American work. Proceeding on through this canal and a few miles of the Erie, the boats reached Albany where they entered the Hudson River and descended along it to New York City.

IV

From the foregoing brief historical outline it seems that inland water navigation influenced the general course of economic development. There is a connection between the construction of canals and the commercial or maritime states, as well as a connection between the neglect of inland navigation and the agrarian or essentially land states. Both the Persian and Roman empires had alternate periods of canal construction and neglect of canals coinciding with periods of change in the character and extent of their territories. There would also appear to be a relationship between a keen interest in canals and the existence of an efficient centralizing administration. And finally, canal building might be considered one of the life-giving works of man, since in various societies from earliest times to the present canals have played a major role in the creation of wealth.[2]

I

Though the French did little toward the improvement of inland navigation in Canada prior to 1760, this was not, as we shall see, due to any lack of interest in the subject by officials at Quebec or Versailles. In the case of fur, one of the staple products of New France which was high in value in relation to its weight, transport costs were not a crucial factor; the staple found an easy outlet through the Ottawa River. New France's concentration of energies and financial resources upon a single staple product, however, hindered attempts to build up a more diversified economy. Lacking this economy, which would have required improved transportation, there was no overpowering pressure on the government of New France to undertake the costly construction of canals about Montreal.

This does not mean that the construction of canals was neither considered nor attempted: quite the reverse. The Sulpicians, who were the seigneurs of the island of Montreal, initiated the improvement of inland navigation. In 1680 the superior, Dollier de Casson, proposed, as had others, to build a canal from Lake St. Louis to a small lake on the island out of which flowed the St. Pierre River, which paralleled the St. Lawrence and flowed into it near the centre of Montreal. Such a canal would serve as a source of power and improve water communication. By diverting water from Lake St. Louis the canal would not only increase the flow of the St. Pierre, thereby allowing water-mills to be built, but it would also provide a safe water route for canoes around the dangerous rapids at Lachine. However, Dollier de Casson's proposal proved to be stillborn. His superior in Paris refused to allow the undertaking owing to lack of funds.

Dollier de Casson, nevertheless, refused to be discouraged. A decade later, a greatly increased population in the Montreal district created a pressing need for mills. But labour, always a scarce commodity in New France, was required for the canal project. We find, therefore, an ordinance, dated 5 June 1689 and signed by the intendant, Bochart de Champigny, declaring that the inhabitants of Lachine who had failed to pay their seigneurial dues to the Sulpicians should discharge their obligations by working for the seminary.[1]

Along with the ordinance appeared a public notice, bearing the same date as the ordinance and signed by Dollier de Casson, declaring that the debtors were to proceed with pick and axe to clear the Little St. Pierre River.[2] Work began a week later on the first canal in North America. Dollier de Casson estimated that it would take only two months to complete the work. This estimate proved hopelessly unrealistic. Two months later came the savage Iroquois attack on Lachine and the devastation wreaked on this whole district by the Indians affected its life and growth for many years and put a stop to any canal construction.[3]

Yet Dollier de Casson still clung to his dream. Eight years later he began to dig a canal to facilitate communication between Lachine and Montreal.[4] As has already been pointed out, such a canal would not only avoid the very dangerous Lachine Rapids which took an annual toll in lives, boats and canoes, but would allow the construction on it of much needed mills to serve the seminary and local inhabitants. In 1700, therefore, Dollier de Casson let the contract for excavation of a canal extending from Lake St. Pierre to a point above the worst part of the Lachine Rapids. It was to be about a mile in length, 12 feet wide at the surface of the ground, with a depth of 18 inches at the point of lowest water in the St. Lawrence. Work was begun in the autumn of 1700 but the contract was never completed. Dollier de Casson died in October of the following year at the same time the contractor became bankrupt.[5] He had, however, made a good start on the work. All that remained to do was a cut three or four feet deep for a distance of less than one-half mile. But the Sulpicians had already spent 20,000 *livres* on the project and their resources simply did not allow for its completion.[6]

II

In March 1703, René-Charles de Breslay, a Sulpician, was named parish priest of Sault-Saint-Louis at the extremity of Montreal Island. He soon expressed the need to complete the work begun by Dollier de Casson.[7] At the same time the French authorities became interested in the project and gave some thought to finishing the job. In 1706, Governor Rigaud de Vaudreuil and Intendant Raudot informed the home government that they had commissioned Sieur de Beaucours, an engineer and highly respected officer, to inspect the unfinished canal and report on the feasibility and probable cost of completing it. At the same time the governor and intendant stressed the favourable effect which a navigable canal would have on the economy of the Montreal district. They also added that should the Crown be prepared to undertake the work, the Seminary of St. Sulpice would contribute an additional 5,000 *livres* to help defray expenses.[8] In his instructions to the governor the following year (1707), Louis XIV expressed his pleasure at receiving Beau-

1 Lieutenant Colonel John By (1779-1836), military engineer. By served in Canada, 1802-11, at which time he worked on fortifications and constructed a canal on the St. Lawrence. He returned to Canada in 1826 to build the Rideau Canal which was completed in 1832. (*Public Archives of Canada*.)

cour's report while at the same time declaring his inability to incur such an additional expenditure at that time. The King suggested that the project be held over till peacetime unless, of course, some way could be found to proceed with it without involving any cost to the Crown.[9] We know that Louis XIV took a keen interest in canals. The Languedoc Canal, which he opened with great pomp and ceremony in 1681, was one of the great achievements of his reign. A fantastic undertaking for its time, this canal extended 144 miles and is still in use today. Also during the reign, Vauban drew up plans for a system of canals to link all parts of France in one great water-route network.

It was about this time (1707) that a marble quarry was discovered some 50 miles above Montreal and some 3 miles from the Long Sault on the Ottawa River.[10] As a result, we find Louis XIV writing to Intendant Bégon in 1714 to say that he had received a specimen piece of this marble from M. de Breslay who urged upon the King the completion of the canal project in order that this quarry might be worked and the large blocks transported by boat down the St. Lawrence. The King took the position, however, that the product did not appear of sufficiently good quality to warrant the great expense involved in finishing the waterway.[11] Late in the same year Intendant Bégon wrote to the minister at Versailles that persons visiting the quarry had assured him that the product was of good quality, but that the expense involved in transporting it by road would be prohibitive while at the same time it would not be possible to transport it down the river by boats sufficiently large to carry the huge blocks. The intendant was inclined to see the Seminary of St. Sulpice behind all schemes put forward for the completion of the canal. The seminary's purpose, according to the intendant, was to furnish sufficient water to their mill at Montreal which, except in springtime, always faced the threat of a water shortage. Moreover, Bégon again expressed the great difficulty in finding sufficient labour to do the job.[12]

III

In 1717, Chaussegros de Léry, a French civil engineer, reported that only about one-quarter of the old canal remained to be finished.[13] The question of completing it, however, was again deferred till 1732. In that year M. François Chèze of the Sulpician seminary charged Chaussegros de Léry to prepare plans and reports and both Governor Beauharnois and Intendant Hocquart tried once again to interest the home government in the project.[14] In his letter of 17 March 1733 to these officials, the minister of marine wrote that while he fully understood the advantages such a canal would bestow on the colony and was prepared to urge its construction to the King, before doing so he must have more detailed information regarding the work and an accurate estimate of the expense involved.[15] Chaussegros de Léry made a thorough investigation of the project, finding out what had already been done, deciding what remained to be done, and preparing an accurate estimate of cost. The officials of New France hoped that Chaussegros de Léry's report would decide the question once and for all; whether to complete the project or to abandon it. Following an intensive study of the situation in which he planned a canal involving locks, Chaussegros de Léry submitted a pessimistic report.[16] He found that the amount of work required to be done would be more difficult and the expense involved would be greater than anyone had suspected. A cut, a league in length and six feet deep, would have to be made through solid rock. To complete the work would cost 255,000 *livres*. He also encountered the perennial shortage of labour for such work. And finally, the straitened financial condition of the French treasury throughout the 18th century precluded any serious attempt to complete the canal at Lachine.

IV

In the light of what was to follow, this short study is significant for it indicates, at the very beginning of canal construction in Canada, some of the problems to be encountered later when a vast programme of construction got under way. Nearly everyone – government, businessmen and general public – was convinced of the necessity to improve waterways. Canals were often started as local projects supported by private individuals or institutions prepared to spend money. But money was always scarce. Almost invariably the actual cost greatly exceeded the original estimate, whereupon more money would be spent in the hope of salvaging the original investment. Moreover, there was often a scarcity of labour for such work. And finally, when private enterprise faltered an attempt would be made to involve the government.

Canals and the Defence of the Canadas, 1763-1841

I

The Peace of Paris in 1763 left Britain in possession of the eastern half of the North American continent stretching from Hudson Bay to the Gulf of Mexico. Very quickly the government of the new Province of Canada became concerned with the problems of transportation and communication. The immediate demand was for improved transportation on the Great Lakes where fur had to be transported eastward and bulky supplies of flour, corn and pork carried westward from the agricultural centres about Detroit and Niagara to Michilimackinac. In time a few government and privately owned vessels came to handle the commerce which developed on the lakes. In 1777, however, Carleton, as a war measure, prohibited the navigation of private vessels on these waters. The government now seized all vessels on Lakes Ontario and Erie and goods could only be transported in the King's vessels from Carleton Island to Niagara and from there to Detroit, at which place the goods were unloaded from the vessels and placed in the forts. This procedure made it less likely that such goods might be conveyed to the enemy. Upon becoming governor-in-chief in 1778, Haldimand continued this policy, believing that if the transport of any merchandise on the Great Lakes except in the King's vessels was permitted, a door would be opened for clandestine illicit commerce hurtful to the province. He feared that a great part of the furs from the upper country would reach the American states by small rivers running from the lakes, and he especially feared a flow of furs from the upper country directly to Albany by the great route of the Oswego. Haldimand believed that everything possible must be done to prevent the Americans from reaching into the interior parts of the country and making contact with Indians friendly to the British, resulting eventually in the former supplanting the latter in the fur trade.[1]

Meanwhile, government stores and merchant goods jammed up and put a great strain on the small provincial marine. At the same time, an even greater strain was put on the weakest link of the long inland navigation route from Montreal to Michilimackinac; namely, the freighting done by corvée along the rapids of the upper St. Lawrence between Montreal and Lake Ontario. This freighting became yearly more burdensome as trade increased with the upper posts, though the greater part of this work was done in the early spring and fall, thereby leaving the men time to work on the farms. Both the need of corvée and the hatred engendered by this legacy of the French régime gave much concern to the British governors.[2]

The passage of the St. Lawrence River, between the Island of Montreal in Lake St. Louis and the broadening waters of Lake Ontario in the lower reaches of Lake St. Francis, was hindered by a narrowing of the river to a series of strong rapids at three locations: the Cascades, a few miles from the port of Montreal; the Cedars, some 25 miles up-river, and at Coteau du Lac near the entrance to Lake St. Francis. The rapids at Coteau du Lac were the narrowest and swiftest, and their influence upon the restriction of military and commercial movement the most important. Water transport was confined to difficult and dangerous passage by canoe or the smallest of boats. This meant that heavy cargo was required to be portaged overland and transhipped at the small ports on Lake Ontario.

In 1779, Haldimand ordered a reassessment of the fortifications, defensive and engineering works under his command. To assist in the work he called upon Lieutenant Twiss, commanding Royal Engineer in Canada, for consultation and reconnaissance. At the same time, April 1779, Haldimand charged Colonel Thomas Carleton, younger brother of Sir Guy and commander of the city and garrison of Montreal, to increase "the flow of goods to the upper outposts" of the St. Lawrence and the Great Lakes. The following month found the governor-in-chief coming to the conclusion that the "upper outposts" were more likely to be attacked than were the southern parts of the province. He, therefore, became keenly concerned about the transportation of provisions to reinforce the posts along the St. Lawrence to the west and into the Great Lakes.

During the early summer of 1779 Haldimand, in consultation with Twiss and possibly Carleton, formed a plan for the construction of a fortified canal across a narrow peninsula of land at Coteau du Lac, on the north side of the St. Lawrence, in order to by-pass the swift waters of the rapids at that place. The military need for the work was well established. It is also considered possible that private commercial and business interests in the upper lakes, deprived of the use of merchant vessels on the orders of Carleton, compelled the consideration of canals. But regardless of reason, the construction of a small canal at the Coteau was to have considerable military and commercial value.[3]

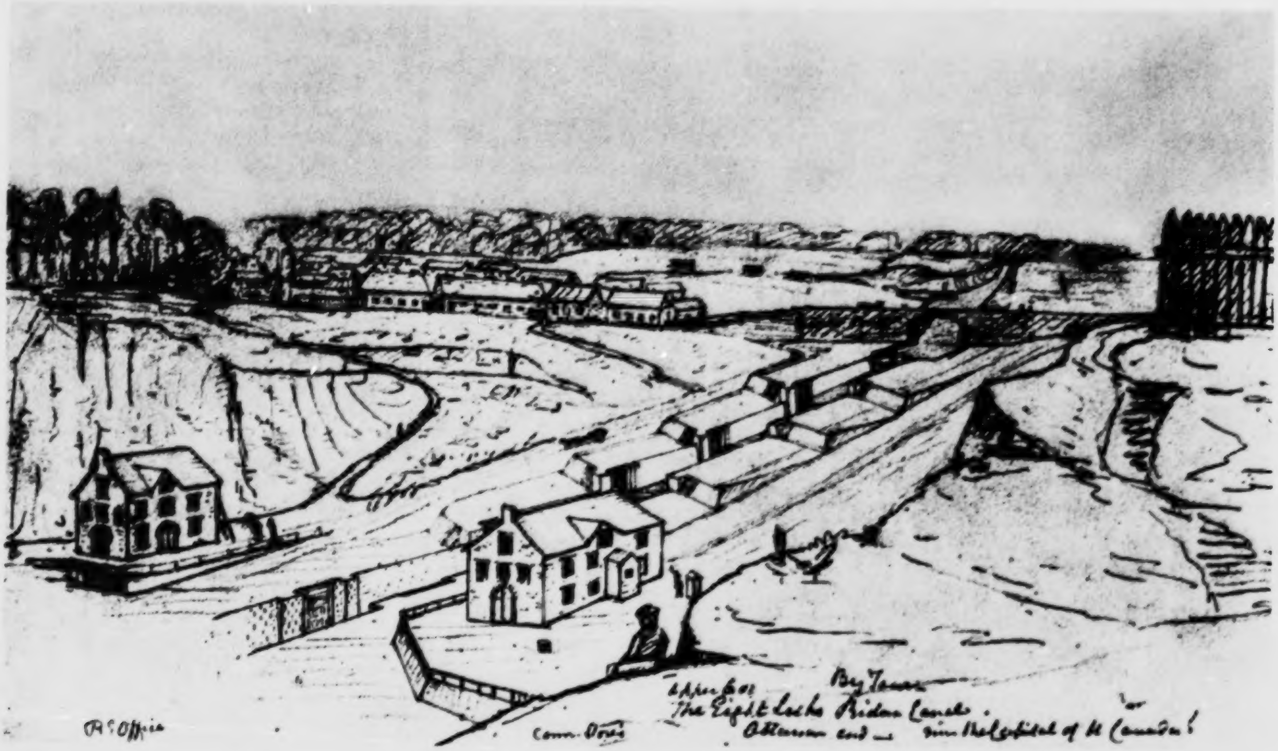
II

Work on the four short military canals on the St. Lawrence was begun in 1779 under the direction of Captain Twiss. They were built by the government to overcome the rapids at the Cascades and Cedars. Once the work got under way Cornish miners were brought from England to do the rock-cutting. The following is a brief description of these canals found in *Canada and its Provinces.*

The first canal situated at the Faucille Rapids, a short distance above Cascades Point, was 400 feet long and 6 feet wide and was equipped with one lock. The second, of the same width, was at the Trou du Moulin near the mill owned by the Baron de Longueuil. It consisted of a cut some 200 feet long, unprovided with locks. At Split Rock Rapid advantage was taken of a natural opening through the rocky shore, known as the Split Rock. This passage was 200 feet long and was equipped with one lock, the sides of which were formed by the natural walls of the channel. The last and most important cutting was at Coteau du Lac. It had three locks and was 900 feet long by 7 feet in width. This series of Canals was thus about 1700 feet in length, with five stone locks, each six feet wide with the exception of those at Coteau du Lac which were seven feet. The locks had a depth of two and a half feet in the mitre sills, and were designed for bateau or normal small boats carrying from thirty to forty barrels of flour.[4]

Much correspondence passed between governor and engineer as the work progressed. Writing to Haldimand on 2 December 1779,[5] Twiss stated that the work at Coteau du Lac would greatly advance the transport to the upper country by making it the easy passage for *batteaux* and that he hoped to complete the work at Coteau by the following summer. Construction, however, did not proceed as quickly as expected. On 5 June 1780,[6] Twiss wrote that he would soon have more workmen on the

2 The eight locks of the Rideau Canal, Bytown, about 1828, a sketch by E. C. Frome. On the left is the office of the Royal Engineers; centre foreground, the Commissariat Stores building. The bridge above the last lock is the Sappers Bridge. (*Royal Commonwealth Society.*)


R.E. Office
Comm. Stores
By Town
The Eight Locks Rideau Canal
Ottawa end — or since the capital of U. Canada!

job and thus possibly complete construction of the Coteau locks by the end of September. Experience had already forced him to change the plan of construction and instead of having timber sides they were to be built of masonry. Twiss believed that the locks at Coteau du Lac would prove "as useful as any in the world." Finally, on 15 February 1781,[7] he informed Haldimand that the canal at Coteau was now complete and in good order and so situated that it could not be destroyed by ice. On the opening of the canal at Coteau du Lac, and to assist in the transport of cargo, the Commissariat Department raised a company of *batteau* men under the command of Captain Herkimer and stationed a detachment there supplementing the military engineers and artificers engaged in construction of the canal and fortified post.

In his letter of 15 February 1781,[8] Twiss warned that many difficulties still remained in the navigation about the Cedars. Haldimand, believing that the canals would prove of great advantage to the merchants and that it was important that the whole expense should not fall on the government, instructed Twiss to speak to the merchants on this point. Thereupon, Twiss attended a meeting of the merchants whose goods passed through the Coteau Canal and informed them of Haldimand's belief that each *batteau* belonging to a private person should pay a toll. The merchants cheerfully accepted this idea, consenting to pay 10 shillings for each *batteau* passing through the locks. Twiss expected that such a toll would produce from £100 to £160 per annum and thereby hoped that the cost of improvement on the canals would fall lightly on the government.[9] The amount of toll collected during the season of 1781 was £132.5.0.[10] On 19 September 1782, Twiss reported that the locks at the Cascades were built; that two pairs of doors were hung though part of the floor and sluices still remained to be finished.[11] He assured the governor, however, that loaded *batteaux* would pass through in six or seven days, though a great quantity of stone must still be brought and laid on the outside to secure the work against ice. At the Little Rocks, Twiss found that six Cornish miners had done good work to open a large channel close to the shore through which "loaded bateaux will pass without difficulty and without the expense of floodgates." The Cornishmen were also working on the canal at the Trou du Moulin near the mill owned by the Baron de Longueuil and at the Buisson. Twiss concluded his report by stating that at Coteau du Lac the walls of the locks required painting since they were not yet as waterproof as they should have been.

A year later on 23 August 1783, Twiss reported good progress of the work and assured the governor that the whole would be completed about 30 September at which time he proposed to discharge the workmen.[12] He directed that the canal at the Baron de Longueuil's be finished while at the same time insisting that the baron pay a part of the expense. Tolls received during the year at the several locks totaled £175.15.0. And Twiss went on to add that "when the lock at Split Rock is finished, the toll upon each bateau will be 25 shillings" which would most likely amount to £325 currency annually in tolls. He believed this to be an ample sum to pay all persons employed on the canals as well as all expenses necessary to keep them in good repair. Boats in the King's service, would of course pass free. At the time of their completion, about 260 craft annually used the canals. They were always considered as a military line of communication and their principal use prior to the formation of the Rideau Canal was for the passage of *batteaux* belonging to the Commissariat Department.

In 1800, Colonel Gother Mann of the Royal Engineers was authorized to make a report on these canals.[13] He found them to be in bad condition. He also found that, due to a fall in the water level of the river along with an increase in the size of the craft using it, drastic alterations were required in the construction of the locks. The visible fall in the water level he attributed to the clearing of land for settlement which caused many small streams to nearly dry up and, while not as yet of any great consequence, the fall would undoubtedly continue with increased settlement and development of the country. The increase in the size of craft using the river Mann attributed to the merchants who found it advantageous to enlarge the dimensions of their boats navigating between Montreal and Kingston. As a result of these two factors, the present locks and canals were not only deficient in depth of water but were also too narrow. This caused the larger boats to pass through only with difficulty, part of their load having to be taken out which meant additional labour and delay. Mann stressed the great convenience of the canals, when in a proper state, to government and commercial interests especially in relation to Upper Canada. He believed that the toll arising from improved canals would justify and repay the expense involved in substantial repairs and required improvements. He estimated the amount of toll at £600 per annum and increasing yearly, and held that improved canals and larger boats passing through them justified an increase in rates.

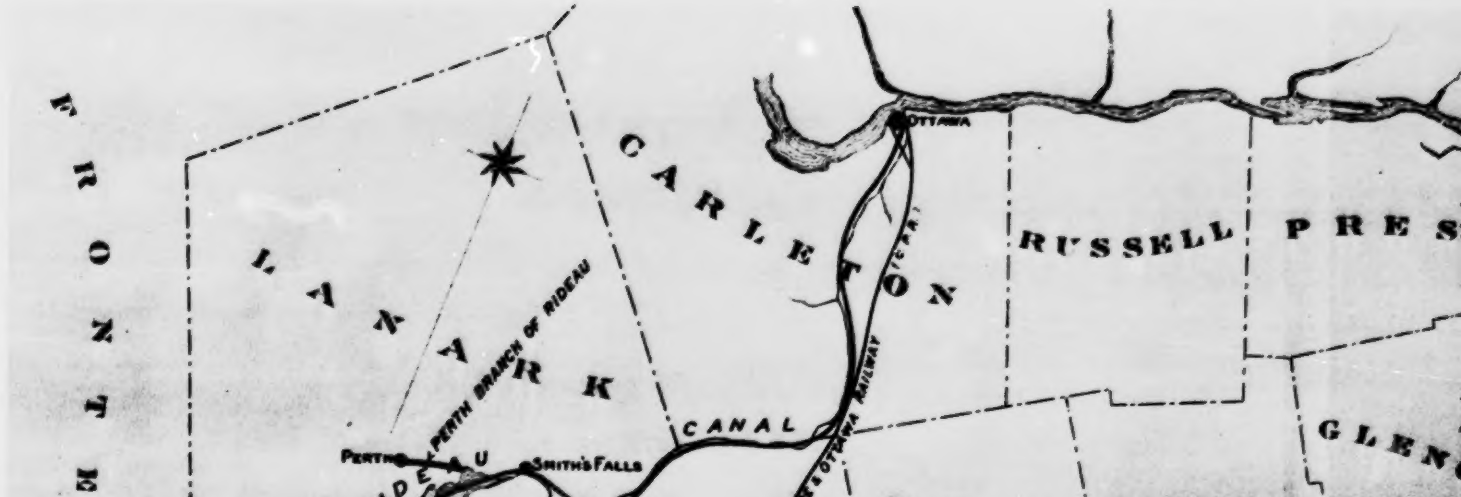
Mann proceeded in his report to treat each lock separately, indicating its present condition, the repairs and alterations necessary, and the probable expense involved. At Coteau du Lac he found the walls of the locks defective, the gates and sluices decayed, and the locks so narrow that the *batteaux* passed only with greatest difficulty. His proposals were, besides a thorough repair job, to enlarge the opening of the gates, to widen the canal by 2 feet and the locks 4 feet, and to deepen the canal by 1½ feet. With these alterations the canal could handle the biggest loaded *batteaux* and boats of large dimensions, even when the river was low. He estimated the cost of these repairs and improvements would be £882 currency. At Split Rock, Mann found the lock in fair condition but with the same defects in point of dimensions. He proposed, therefore, to deepen the lock 2 feet and enlarge it 4 feet and deepen the channel leading to it. Cost of repairs and improvements he estimated at £364 currency. The locks and canals at Mill Rapid and Cascades he found to be in such bad condition and to require such extensive repairs as to be nearly equivalent to rebuilding them. Ice had done great damage here and in the past maintenance costs had been extremely high. Mann therefore advised that a new canal be built to avoid both rapids and he estimated the cost of such a work at £2,881. He recommended temporary repairs to the two existing canals and suggested that they be used during the construction of the new one in order to prevent interruption to navigation.

As a result of Mann's report, some improvements were made though, because of the expense involved and the unlikelihood of repayment through tolls, these improvements were not as extensive as he proposed. In 1804, the locks at Coteau du Lac and Split Rock were partially rebuilt and a new canal about half a mile in length with three locks, six feet in width between the posts of the gates, was constructed at the foot of the Cascades instead of the old locks at the "Faucelle" and the "Trou du Moulin." Writing to the military secretary on 16 January 1805,[14] Captain R. H. Bruyères of the Royal Engineers gave a detailed account of the work on the new canal and on 7 March 1805,[15] he estimated that its construction would cost an additional £472 above Mann's estimate. Additional expenditure was due principally to the difficulties encountered in rock-cutting, excavating the rock, and constructing masonry below water level. Other difficulties had arisen, not the least of which was a shortage of labour. Whenever manpower was needed for removing large stones or more frequently to clear the water from the canal after heavy rains, the artificers had to assist the labourers, which naturally retarded their progress. Moreover, it would seem that Mann in his report had not been fully aware of, and had not made sufficient allowance for, the great difficulty and expense involved in keeping the work free from water. Despite these difficulties the canal was completed in 1805.

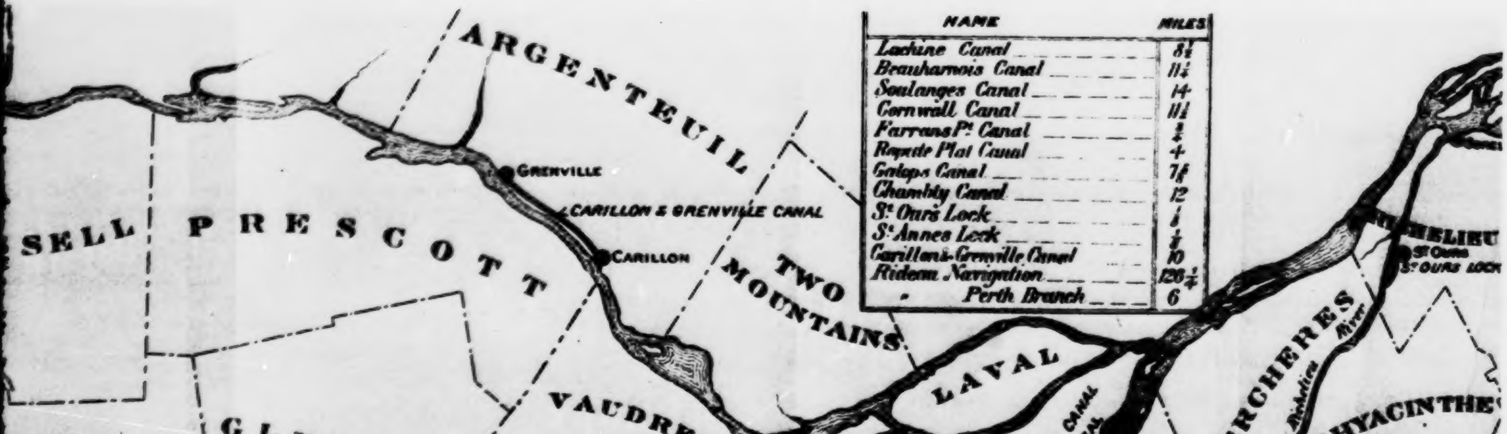
A St. Lawrence waterway, navigable for small war and supply vessels up to the Great Lakes, afforded the inhabitants of the Canadas a considerable degree of military security since it enabled Britain to protect the Canadas with comparative ease. Without such a waterway defence of the Canadas would be difficult. The War of 1812 drove this lesson home. At that time, no less an authority than the Duke of Wellington declared that naval superiority on the lakes was a prerequisite to a successful land war.[16] The military authorities responsible for the defence of the Canadas were made acutely aware of the problem when the transport difficulties encountered during the War of 1812 impressed upon them the necessity of having unimpeded communication with the frontier of Upper Canada. In 1814 the commissary general addressed a long memorandum to the governor-in-chief and commander of the forces, Sir George Prévost, warning him that

> *The difficulties experienced in the transport of Stores and Provisions during the last Season for the construction, armament and equipment of His Majesty's Ships on Lake Ontario for the supply of Troops in Upper Canada imperiously demand that means be properly devised for a certain conveyance of the innumerable Articles necessary for maintaining in that Province the great and increasingly Naval and Military Forces requisite for its defence.*[17]

He proceeded to point out that the cartage from Montreal to Lachine was extremely burdensome – that no less than 15 to 18 thousand loads of public stores were carted during the season to Lachine and much of this work was done by farmers called from their lands to perform it. The commissary general further pointed out that the *batteau* men for the transport from Lachine to Kingston were ordered on corvée from the parishes, that the severity of the service caused many to refuse to obey the orders to report, and caused others to desert from the *batteaux* en route. Moreover, since it was the opinion of the crown lawyers that these men could not legally be convicted, the commissary



3 Map showing the St. Lawrence, Ottawa, Rideau and Richelieu canals. (*Annual Report, 1894-95*, Dept. of Railways and Canals.)



NAME	MILES
Lachine Canal	8½
Beauharnois Canal	11¼
Soulanges Canal	14
Cornwall Canal	11½
Farrans Pt. Canal	¾
Rapide Plat Canal	4
Galops Canal	7⅝
Chambly Canal	12
St. Ours Lock	⅛
St. Annes Lock	⅛
Carillon & Grenville Canal	10
Rideau Navigation	126¾
" Perth Branch	6

4 The first eight locks of the Rideau Canal, Bytown, 1830. (*Public Archives of Canada.*)

general suggested that to effect the great improvement in the navigation would require considerable expense and labour and that "the practicability of making a canal between Montreal and Lachine should be immediately ascertained."[18]

III

With the close of the American Revolution, the British government faced the problem of finding suitable locations for the settlement of disbanded soldiers and Loyalists moving northward into what is today the Province of Ontario. In 1783 parties were sent forth to explore the country on either side of the Ottawa River. One of these was led by Lieutenant Jones who travelled up the north side of the Ottawa as far as Chaudière Falls before crossing the river and returning along the south bank to Montreal. Another party led by Lieutenant French came up the south side of the Ottawa; portaged at Rideau Falls on 2 October 1783; proceeded along the Rideau to its source in the Rideau Lakes; portaged to the Gananoque River; sailed down it to the St. Lawrence, and returned to Montreal. In his exploring, French had traversed the general line of the present Rideau Canal and had shown that a through route existed between the Ottawa and the St. Lawrence. His report[19] proved to be "the first written record of the Rideau Waterway." Though nothing was done in the way of settlement as a result of these reports, it is possible that the feasibility of utilizing the Rideau River as a military canal route between Montreal and Kingston was brought to the attention of the British government around 1790.

The War of 1812 demonstrated to the British in London and Canada the vital importance for all military operations, offensive and defensive, of improving communications in the Canadas and in particular to taking special measures to command the lakes and inland waters. During the war the Americans threatened to interfere with communications between Lower and Upper Canada along the St. Lawrence River system which was "practically incapable of defence in time of war." Consequently, British military leaders gave serious thought to an alternative water communication between the two provinces.[20] The most obvious route was by way of the Ottawa and Rideau rivers. "Even before the end of the fighting, Sir George Prévost, commander of the British forces, had written to Lieutenant General Sir George Drummond at Kingston enclosing plans for a Rideau system and asking for comments upon these plans and for further information."[21] Drummond sought the opinions of three local and experienced officers before replying that such a project would involve immense difficulties and expense.[22]

A few months after receiving Prévost's letter and plans relating to a Rideau waterway system, Drummond received from Lord Bathurst, Secretary for War and the Colonies, instructions dated 10 October 1815, to "get estimates of expense of the Lachine Canal and of the Ottawa and Rideau being navigable, in order that His Majesty's Government may decide as to the propriety of undertaking these works, each separately or simultaneously."[23] Apparently the British government intended to consider the entire question of navigation from Montreal to Kingston of which the Rideau Canal was a substantial part. Drummond passed the instructions over to Lieutenant Colonel G. Nicolls, commanding Royal Engineer in Canada. Nicolls was directed to send an officer to explore and report upon the feasibility of the route between Kingston and the Ottawa River. Lieutenant Joshua Jebb was selected for this task. He was instructed: "(1) to follow up the course of the Cataroque from Kingston Mills, and keeping a northerly direction to penetrate into Rideau Lake, and descend the river which flows from it to the confluence with the Ottawa; (2) to return up the river as far as the mouth of Irish Creek, and trace the waters of which it is the outlet to their source, and from them to follow up the best communication he could find to Kingston Mills, or to the Gananoqui, and suggest any temporary expedients for improving the navigation so as to render it available for *batteaux*; and (3) to take note of the country with a view to its being deemed eligible or otherwise for the establishment of military settlements."[24] Jebb completed his work in the late spring of 1816. In his report he stated that the establishment of a water route between Kingston and Ottawa by means of the Rideau and Cataraqui rivers was practicable; that both routes examined by him were acceptable but that he preferred the shorter one by way of Irish Creek.[25] Nothing further, however, was done following the receipt of Jebb's report with regard to the Rideau Canal until 1821.

Meanwhile the British government continued to show keen interest in military communication. Bathurst wrote to the lieutenant governor of Upper Canada in 1816, regarding the Rideau project, that His Majesty's government was "most desirous that preparatory measures should be taken for the performance of this important work."[26] The home government was urged to undertake this work by the wartime naval commander on the lakes who wrote, on

30 May 1815, about the necessity of a naval squadron along with "a large military and naval establishment and a secure passage for supplies by opening up the Ottawa and Rideau Rivers."[27] At the same time, the Duke of Richmond, a distinguished soldier and governor-in-chief of British North America (1818-1819), was much concerned with defence measures and strongly favoured the Rideau project stating that "the possession of the St. Lawrence above Cornwall for the conveyance of reinforcements or stores ought not to be ours for three days after the commencement of hostilities."[28] In his remarks Richmond emphasized the necessity of delaying tactics against the enemy so as to give time for reinforcements and supplies to arrive from England. For this, defence works and improved lines of communication were a necessity along with a cooperative and enthusiastic militia.[29] Richmond had served under Wellington at Waterloo and was partly responsible for the active interest which the Iron Duke, as master of the ordnance and therefore involved in all operations of the British Army, took in the Ottawa-Rideau project. Wellington addressed a strong memorandum to Bathurst in 1819 stressing its importance.[30]

IV

In the previous year (1818), Captain J. F. Mann of the Royal Engineers had surveyed the Ottawa River and found its navigation impeded by the rapids at Carillon and Grenville. He therefore recommended the construction of three canals with locks between Carillon and Grenville in order to overcome a fall in the river of nearly 60 feet. Mann estimated that construction of these canals – Carillon the lowest, Grenville the highest and Chute-à-Blondeau the intermediate one – would cost the British government £16,740.[31] The three canals were designed by the imperial authorities in 1819 on the scale of the Lachine Canal and construction was commenced the same year under the direction of the Royal Engineers at Grenville, midway between Montreal and the Rideau River. The locks were 106½ feet in length by 19½ feet in the chamber with 6 feet of water. Unfortunately, the Grenville contained a small lock of 106-5/6 feet by 19¼ feet which determined the size of the vessels that would be used on the Ottawa-Rideau waterway. Later in 1828 before their construction was completed, it was decided to increase the size of these canals in order that they resemble more closely those on the Rideau. The construction of these canals on the Ottawa was necessary in implementing the imperial government's decision for an interior route between Montreal and Kingston via the Ottawa and Rideau rivers which could serve as a "military water highway" in any future war with the United States.[32]

V

It has already been pointed out how during the War of 1812 due to transport difficulties it was a great strain to get stores and provisions through to the naval and military forces in Upper Canada, thereby threatening the continued existence in that province of the forces required for its defence. Writing to the governor-in-chief and commander of the forces in November 1814, the commissary general had urged, as a step in ameliorating the difficulty, that "the practicability of making a Canal between Montreal and Lachine should be immediately ascertained by scientific men."[33] This was not the first time that attention had been focused on the need of a canal at the Lachine Rapids. As early as 1791 the increase in trade between Upper and Lower Canada had indicated the need of such a canal as an essential link in the navigation of the St. Lawrence. In that year, Adam Lymburner, a Quebec merchant, urged the building of such a canal pointing out that the costs of carting Upper Canadian goods past the rapids would "fall very heavy on the produce of the lands."[34] Five years later John Richardson introduced in the Lower Canada House of Assembly a bill for the construction of a Lachine Canal.[35] His premature proposal, however, was dropped due to a general lack of interest. The project was left in abeyance until the commissary general's memorandum again raised the question, whereupon the government decided to act quickly in the matter. In January 1815, shortly before the cessation of hostilities, the Lower Canada House of Assembly received a message stating that:

> *His Majesty's Government having in contemplation the speedy opening of a Canal from the neighbourhood of the Town of Montreal to Lachine, His Excellency the Governor in Chief recommends the subject to the early consideration of the House Assembly, and that they will grant such supply and other Legislative provision as they may deem expedient to assist in carrying into execution so important an object and whereas the execution of such a project will greatly benefit His Majesty's service, ameliorate the Internal Communications of this Province and thereby tend generally to the encouragement of the agriculture and commerce thereof.*[36]

The legislature of Lower Canada responded to this appeal with "An Act to grant an Aid to His Majesty to assist in opening a Canal from the neighbourhood of Montreal to Lachine and further to provide for facilitating the execution of the same."[37] The sum of £25,000 was appropriated for the purpose and three commissioners were appointed and entrusted with the execution of the work.

Captain Samuel Romilly of the Royal Engineers now studied the project, made a survey, estimated costs and submitted his report in 1817.[38] He found that the navigation of the St. Lawrence from Montreal to Lachine, a distance of about 10 miles, was very difficult owing to the rapid current and the shallowness of particular parts. A strong current called St. Mary's extended for 2 miles below the town of Montreal at the foot of which vessels were detained frequently for weeks till they got a wind sufficiently strong to enable them to stem the current. Romilly estimated the cost of a canal with a depth of 3 feet of water and capable of passing Durham boats 60 feet long, 13 feet 6 inches wide and drawing 2 feet 6 inches of water at slightly over £46,000 Halifax currency (at that date £36,800 sterling). From his point of view the greatest objection to such a canal was that the stagnant water in it would freeze some time before the river and therefore the canal would cease to be navigable for several weeks before the St. Lawrence closed to navigation. Romilly's estimate of costs was almost twice the figure of £25,000 appropriated for the project. The prospects of the canal being constructed under government direction therefore did not seem bright. At the same time the British government had now focused its attention on the construction of the Rideau Canal. Nevertheless, the imperial authorities, preoccupied as they were at this time with the problem of defence and the survival of British power in North America, were prepared to give financial assistance should the Province of Lower Canada shoulder the responsibility of constructing the canal since it was an important link, not only in the St. Lawrence route, but in the Ottawa-Rideau system as well.[39]

Following the unsuccessful attempt of a private company to construct the canal, the Province of Lower Canada undertook to complete the work.[40] The first sod was turned in July 1821 and the canal was opened in August 1824. The final cost of £109,601 greatly exceeded the original estimates and of this amount all but a £10,000 aid by the British government was contributed by the province. This aid of £10,000 was granted on condition that free passage be granted to military stores and to all boats in His Majesty's service.[41]

VI

In 1821 at a time when the Erie and Lachine canals were under construction, the government of Upper Canada moved to improve the internal navigation of the province. An Act was passed appointing commissioners to report on the subject.[42] "The commission, headed by the Hon. John Macaulay of Kingston, worked for four years."[43] Though it concentrated its attention on major obstacles like Niagara Falls and the rapids of the St. Lawrence, the commission did find time to consider the Rideau waterway. It engaged Samuel Clowes, an experienced civil engineer, to make surveys of this route. He submitted a detailed report in April 1824.[44] In it he pointed out that lack of an adequate water supply and an excessive amount of required cutting decided him to abandon the alternate route by way of Irish Creek. Instead he prepared estimates for canals with three different sizes of locks all using the route followed by the canal of today. Clowes' estimates for a large canal and locks to a very modest one ranged in cost from £230,705 to £62,258. These figures, even for that time, were wholly unrealistic for "the cost of a canal system almost 130 miles long with 47 locks having a total lift of over 400 feet."[45]

The reports of the Macaulay Commission were placed before a joint committee of the legislature for its consideration and were published in April 1825. The commission's final report on the proposed Rideau Canal referred to the military aspects of it and made an interesting reference to the need of the canal as affording a means of local communication for the military settlements.[46]

During the summer of 1825 the governor-in-chief submitted the Macaulay Commission's report to the military authorities in London. Immediately the British government offered a loan of £70,000 to assist with the construction of the Rideau Canal if Upper Canada would undertake the work.[47] The Upper Canada legislature, however, being convinced that the Ottawa-Rideau route could never compete commercially with the St. Lawrence, favoured improving the latter route. The legislature, therefore, decided not to act on any of Clowes' plans and declined the loan offered by the British government.[48]

Though unable to come to an agreement with the Province of Upper Canada on the project of the Rideau Canal, the British government considered it too important, from a military point of view, to be abandoned. In 1825, Wellington appointed a commission of military engineers headed by Major General Sir

James Carmichael Smyth with Lieutenant Colonel Sir George Hoste and Major Harris as the other members, to visit Canada and report on the defence of the country.[49] Ordered to report on the feasibility of Clowes' plan for the Rideau Canal, the commission traversed the entire route and approved of it. However, the commission questioned the correctness of Clowes' estimates and reported that an additional £20,000 would be required to allow for the increased size of locks (108 feet long by 20 feet wide with a depth of 5 feet) in order to permit gunboats to pass. The commission estimated that the cost would therefore be £169,000. At the same time, the commission attempted without success to work out some cooperative financial arrangement with the Province of Upper Canada regarding the cost of the project. In this respect, the commission made the following report to Wellington:

> *In compliance with Your Grace's command, we have endeavoured to ascertain what assistance, if any, could be procured from the Provincial Government towards carrying out this important work . . . . We regret, however, to say that there does not appear to be the slightest chance of any pecuniary aid from the Province of Upper Canada. The settlers are very poor and the Province still in its infancy . . . . Excepting it is undertaken by His Majesty's Government we are afraid it will never be executed. Companies are forming and cheap and temporary expedients are likely to be resorted to for improving navigation of the St. Lawrence in order to enable the produce from Lake Ontario to be forwarded to Montreal and Quebec, with less trouble and risk than at present. The important advantages of such a communication in the rear of the frontier are not likely to be appreciated by the bulk of the inhabitants of the Province; nor is it probable that for the attainment of a remote good they will agree to any tax or immediate pecuniary loss.*[50]

Wellington, at this time, pressed upon the British government the recommendations of the Smyth Commission for the improvement of communications and the building of fortifications.

> *I do not entertain the smallest doubt that if the communications and works proposed by the Committee are carried into execution, His Majesty's dominions in North America ought to be, and would be effectually defended and secured against any attempt to be made upon them hereafter by the United States, however formidable their power, and this without any material demand upon the military resources of the country.*[51]

However, as it turned out, the application of the Smyth Commission's recommendations, by a pessimistic and parsimonious government, was hesitant and piecemeal. The British government decided though to undertake the construction of the Rideau waterway. This decision was based upon the Smyth Commission's ridiculously low and completely unrealistic estimate of £169,000.

On 10 March 1826, the Board of Ordnance requested General Gother Mann, Inspector General of Fortifications, to select a competent officer of engineers to be sent out to Canada to take charge of the construction of the Rideau Canal. Before departing for Canada this officer was to consult with Smyth who was experienced in the particular duties to be performed and knowledgeable on the subject of the Rideau waterway. Smyth was to draft the proper instructions for the officer selected to undertake this duty.[52] Upon receiving this communication from the Board of Ordnance, Mann selected Lieutenant Colonel John By of the Royal Engineers to take charge of this work.[53]

A few days later, Mann received from Smyth a long memorandum, dated 14 March 1826, pertaining to the construction of the canal.[54] In this memorandum Smyth expressed ideas and afforded information which he believed might be useful to By. The object of the Rideau project, according to Smyth, was to create an uninterrupted water communication from Lake Ontario to the Ottawa River. The undertaking was to form part of a waterway system which included the Lachine and Grenville canals. The locks of the Rideau were to be of the same length and breadth as those of the Lachine and Grenville, namely 108 feet in length and 20 feet in breadth. Smyth expected that strong representations would be made to By from the principal merchants to terminate the canal at the Gananoque River instead of Kingston on Lake Ontario. This mercantile point of view must not under any circumstances be accepted. Smyth stated that the British government had in mind the circulation of gunboats between Montreal and Kingston and military considerations therefore dictated that the canal must end at the latter place. He recommended that By prepare himself for the task by reading Jebb's report, a copy of Clowes' report and his three estimates, and also the reports of the commissioners employed in constructing the Erie Canal, published by the Americans. Smyth believed that these American reports contained a good deal of valuable information pertaining to the great quantities of water which in the spring could injure the canal if not guarded against by culverts

5 A pencil sketch of the Rideau Canal by John Burrows. (*Public Archives of Canada.*)

and waste weirs along with details as to the method of excavating the canal and constructing necessary dams. Smyth further recommended that By go over the work of the Lachine Canal in the company of the commissioners of Lower Canada under whose direction this valuable undertaking had been constructed. This work Smyth believed to be better executed and more substantial than the American Erie Canal. A study of the Lachine work would afford By much information as to price and cost of materials, workmanship and labour. Smyth went on to say that in his opinion it would be found more economical and more expeditious to build the whole of the proposed canal by contract. The Americans had built the entire Erie Canal that way. By's attention was also drawn to the necessity of taking sufficient land on points of the canal nearest to Kingston which from their proximity to Lake Ontario might eventually require Martello towers or batteries to protect the embankments and docks from being destroyed by a landing of the enemy. And finally Smyth foresaw By's need of a detailed letter from the Colonial Office to the lieutenant governor of Upper Canada whose assistance would be required to facilitate by an Act of the legislature or otherwise procuring or purchasing the land necessary for the waterway as soon as By should have ascertained the required boundaries and extent.

On 13 July 1826, shortly following his arrival in Canada, By sent a dispatch to Mann in which he strongly recommended the formation of an uninterrupted steamboat navigation from Quebec to Lake Superior by enlarging the locks of the projected Rideau Canal so as to allow the passage of steamboats then being built for the navigation of the Great Lakes.[55] These boats measured from 110 to 130 feet in length and from 40 to 50 feet in width and drew 8 feet of water when loaded. Use of such vessels would give Britain possession of the trade on the borders of the lakes and completely nullify the strong efforts the Americans were making to dominate this trade by constructing canals. This lakes area with its immense population would, according to By, serve as a great outlet for British manufactured goods. Moreover, canals enlarged to accommodate the new steamboats, each of which could carry 12-pounders and 700 men with ease, would give Britain military domination of the lakes by allowing for the concentration quickly of troops at any point. Canada would then be perfectly secure from attack. By advised also the opening through enlarged locks of the Richelieu River to allow steamboats to enter Lake Champlain and thereby secure for Quebec the commerce from that part of Canada and of the United States bordering on the lake. He believed further that the government needed not only to deepen and make practicable by locks the north passage round the island of Montreal but also to give access to Lake Ontario by what he called "a trifling work at the Falls of St. Mary's." Once the through communication to the Great Lakes was improved the Lachine Canal would not be sufficient to pass 1/100 part of the western trade. By considered this "of no consequence as the bulk of that trade would pass on the North side of Montreal to Three Rivers which being the first road stay in the St. Lawrence will eventually become the general rendezvous for shipping." In the same dispatch he suggested that the Rideau Canal could not possibly be built for £169,000 as estimated by the Smyth Commission. Though he had not been over the ground, By was sure, from the information he had, that it would cost at least £400,000.

Writing to Mann on 23 August 1826, Smyth opposed in the strongest terms By's proposals, especially the need for enlarged canals 50 feet wide.[56] Smyth's principal idea regarding the Rideau Canal was that it would provide for safe military transport to Upper Canada in time of war. Commercial considerations were of little interest to him. He did, however, hope that tolls would eventually be derived from the canal and that the settlers and farmers would use the canal to pass the boats in which they navigated Lake Ontario, the Ottawa and the St. Lawrence. According to Smyth, "a canal of 20 feet breadth of lock will pass gunboats the craft of the country and will pay for its construction." And again: "I do not see any benefit to be derived from a greater breadth without corresponding depth. Locks of 20 feet in breadth will afford every advantage; a larger canal will never pay; and cost a prodigious sum and will not afford corresponding advantages." Finally Smyth showed a complete disdain for commercial considerations by concluding that "It does not appear to me that Lieutenant Colonel By has taken a judicious view of the military features of the defences of Canada in proposing to improve the navigation of the river from Lake Champlain to the St. Lawrence. If he could add to the impediments, it would in my opinion be more advantageous to His Majesty's Service." From Smyth's point of view Canadian canals were to be constructed by the British government for purely military purposes.

Upon learning of Smyth's criticism of the views expressed in his dispatch of

13 July, By sent another one to Mann on 6 December 1826 in which he answered some of Smyth's criticism and once again emphasized the need for a steamship navigation through the canals of Canada along with enlarged locks to accommodate these vessels.[57] By pointed out that the commercial intercourse between Upper and Lower Canada by the sole route of the St. Lawrence meant passing through waters over which the Americans claimed jurisdiction; namely, the navigable channel of the St. Lawrence in the neighbourhood of Cornwall. This meant that the Americans could stop boats and rafts on their passage to Lower Canada or impose on them substantial duties as they chose, thereby inhibiting at pleasure Upper Canada's communication with the seaports and rendering the St. Lawrence a precarious highway for commerce. He informed Mann that the trade between the two provinces was carried in scows and rafts which were loaded with flour, potash, staves and so on, and generally had one Durham boat accompanying five or six of them. The merchants sold not only their produce but also the scows and rafts at Quebec or Montreal returning with their fresh purchase of merchandize in the Durham boat. To prevent this critical trade from being interrupted by the Americans, By urged that the Rideau Canal should be of sufficient dimensions to allow these scows and rafts to pass through it. He strongly recommended therefore, that the locks should be formed 50 feet wide and 150 feet long and only 5 feet deep; the depth of the Grenville and Lachine canals was quite sufficient for the timber trade. By believed that the enlargement of the locks would add about £50,000 to the estimate. He felt it was probable that the whole trade of Lakes Erie and Ontario would eventually have to pass through the Rideau. Observing that the bulk of the trade of the St. Lawrence and Ottawa rivers was carried on in steamboats as well as scows, it became, according to By, a matter of great importance both from a mercantile and military point of view that they should have every facility of movement. In his proposed plan this would be obtained as well as a decided advantage gained by the use of steamboats in the still water of the rivers and lakes. By went on to inform Mann that he continually received opinions of mercantile men engaged in trade. These men insisted that the locks should be constructed on a large scale instead of the 20 feet wide and 108 feet long which they claimed was too short and narrow for their boats. In conclusion By recommended that the lock and cut proposed at Ste. Anne's Rapid should be 50 feet wide and 150 feet long. The work should be commenced immediately and he felt it should be completed in one season. The expense of it would be repaid by the saving that would accrue in the transport of stores and tools required for the Grenville and Rideau canals. These articles could then be unloaded at Quebec and conveyed at once to the Grenville Canal without any cartage.

In the early fall of 1826, By made his initial visit to the site of the proposed canal. Proceeding up the Ottawa River he landed at the little settlement of Hull on 21 September. At the same time, the governor-in-chief of British North America, the Earl of Dalhousie, travelled to Hull and together the two men decided that the entrance of the canal into the Ottawa River should be in a little bay protected from the winds, about one-half mile from the Chaudière Falls.[58] That done, By instructed John Mactaggart, who had been sent from England to be the chief of works on the project, to survey alternate routes for the start of the canal, following which Mactaggart was to proceed throughout the whole route and report upon it. His long report of 3 August 1827 contained a detailed description of the canal route as well as a description of the country through which it would be built.[59] Before returning to Montreal in the late fall of 1826, By arranged for one piece of necessary work; namely, the construction of a bridge across the Ottawa River at the Chaudière Falls. This would provide access to the canal from Hull. At the same time, By also arranged for the laying out of his headquarters with the erection of buildings on the land on the high banks of the river previously purchased by the British government.[60]

The spring of 1827 found By in Montreal busily engaged in the final planning. That done he left Montreal to take up his residence on the banks of the Ottawa. In May, he traversed the whole route of the canal for the first time and during the summer actual work was started.[61] As finally constructed, the locks were 134 feet long by 33 feet wide with a depth of 5 feet.[62] The work was completed in May 1832 when a small vessel, renamed the *Rideau* for the occasion and with By on board, sailed from Kingston to "the wharf at the head of the flight of locks at Bytown."[63] Hereafter the Ottawa-Rideau system was considered to be a first-rate military line of communication.

VII

We have seen how the War of 1812 demonstrated the need of an alternative water communication between Upper and Lower Canada and how the imperial government adopted and developed the Ottawa-Rideau waterway as an answer to that need. The War of 1812 also demonstrated the strategic need of a canal across the Niagara peninsula the lack of which had meant, during the war, the laborious transport overland of military supplies to the Detroit frontier as well as the maintenance of separate fleets on Lakes Ontario and Erie. At the same time events had shown that naval supremacy on the lakes was indispensable to military success on land.

We find, therefore, that following the war interest in canal construction was shared by imperial strategists with the agriculturalists and merchants of Upper and Lower Canada. During the session of 1818 a joint address of the two Houses of Assembly declared for the improvement of navigation of the St. Lawrence to and from Montreal as "essential to the interests of each province in a commercial and to our parent country in a political view."[64] Commissioners were appointed by each province to confer together on the improvement of internal navigation, and the joint report submitted by them in October 1818 declared such improvements to be essential to the prosperity of each province in time of peace and to their security in time of war.[65] Within a week of the presentation of this report the Assembly of Upper Canada received a petition from the inhabitants of the war-ravaged District of Niagara containing a plan to connect Lakes Erie and Ontario by a canal.

> *Your Petitioners, viewing the great benefits these provinces will derive from having a Canal made between Lakes Erie and Ontario, having examined the Report on levelling the land between Chippewa* [sic] *and the source of the Twelve Mile Creek, and have every reason to believe that a communication can be effected at a trifling expense, from the accompanying plan which will be submitted to Your Honourable Body: From the source of the Twelve Mile Creek where the excavation will end, to the brow of the Mountain at Captain Du Coo's* [sic] *is a gentle descent, not a lock will be necessary; after descending the Falls it will be necessary to make locks to pass four or five Milldams, and the navigation will be complete for boats to Lake Ontario.*
>
> *The grand object of the American people appears to be opening a navigation with Lake Erie; which design our canal, if effected soon, will counteract; and take down the whole of the produce from the Western country.*
>
> *Your Petitioners, therefore, beg that you will appoint some scientific men to view the country between Chippewa* [sic] *and Lake Ontario and adopt such measures for carrying the above objects into effect as you in your wisdom may deem meet.*[66]

Upon considering the petition a committee of the whole House referred it to a select committee of four members who reported that "a canal cut agreeably to the plan proposed by the petitioners would be a great benefit to the commercial interests of the province and ought to be encouraged by every means of furtherance by Your Honourable House."[67] The committee also implied in its report that the canal project should be handled by a private company. At the same time a joint address of two houses prayed for the appropriation of a portion of the "waste lands of the Crown for the purpose of improving the navigation of the River St. Lawrence and for cutting canals through this Province" and an act was passed appropriating £2,000 for making surveys of that river, and other purposes.[68] However, no measure was taken to provide this money.

Writing to Bathurst in December, 1818, Sir Peregrine Maitland reported that "there are at present 80 schooners employed in navigating Lake Erie, vessels capable of carrying in the event of war either one or two guns of the larger calibre, of these not more than ten belong to, or are navigated by, subjects of His Majesty." At the same time, in transmitting the joint address of the two houses for the grant of Crown lands for the improvement of navigation, Maitland remarked that the reserves should not be alienated as that would materially "injure the interests of the Crown."[69]

We have noted previously that in 1821 a select committee of the legislature of Upper Canada appointed three commissioners to report on the internal navigation of the province and that the commissioners engaged the Clowes brothers as engineers to make surveys and explorations. During this period official policy concerning the improvement of internal navigation was greatly influenced by official fear of American invasion. Hence we find that the select committee of 1821 recommended when referring to the Niagara project that "a work of this description should not be on an exposed frontier but should be wherever circumstances admit of it, inland."[70] The commissioners apparently accepted this directive and their report in 1823 on the Niagara project recommended a canal 62 miles long from Burlington Bay to Grand River.[71] Such a long, expensive and difficult route had the one advantage that it was not on an exposed frontier. Clearly military considerations outweighed commercial ones. The justification for canals built by governments was the extent to which they contributed to the security of the provinces.

By this date, Upper Canada faced the prospect of an American canal between Lakes Erie and Ontario: hence there was a feeling of urgency concerning the construction of a Canadian canal between the lakes. Instead of being undertaken as a government work, however, a joint stock company was formed in 1824 called the Welland Canal Company,[72] and ground was broken the same year. A detailed account of the construction of the Welland Canal appears elsewhere in this work. All that need be said here are a few words about the route and dimensions of the canal and locks. The original plan was to build a canal 4 feet deep from the Welland River to Lake Ontario suitable only for boats of less than 40 tons burden. It was intended that the canal pass by means of a tunnel through the high ridge of land separating the two watersheds. The rapid descent from the brow of this elevation was to be made by an inclined railway. From the railway another canal was to extend to Twelve Mile Creek from which entrance could be obtained to Lake Ontario. The upper reach of the canal was to be supplied with water from the Welland River.

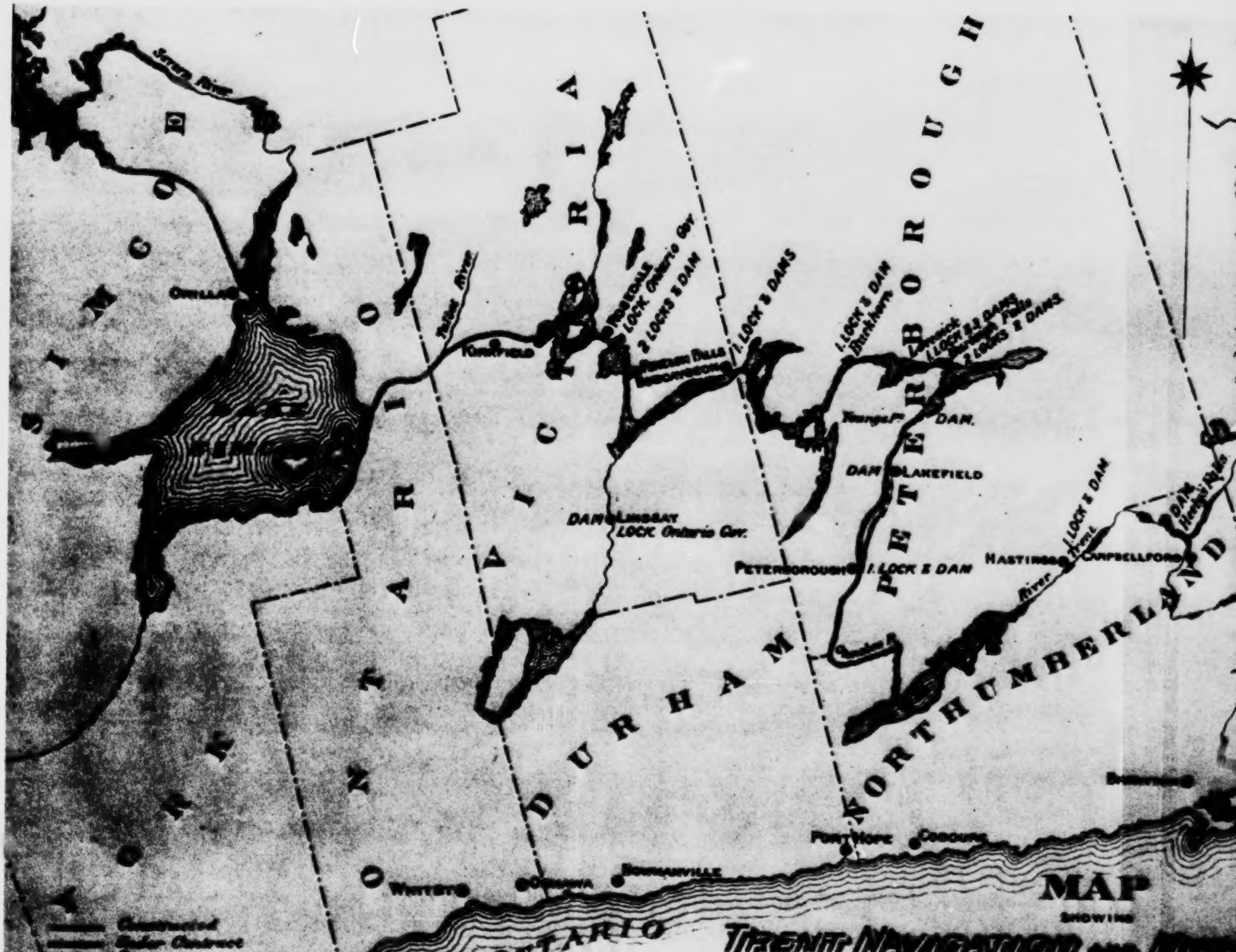
At first the lieutenant governor of Upper Canada and other colonial authorities were filled with doubt and suspicion regarding the work for they had the mistaken belief that the directors had decided on Niagara as the Lake Ontario terminus and this location was on the frontier. This mistaken belief had caused Maitland to recommend to Bathurst that the company's application for a grant of land should be opposed. "If the Canal were conducted into Lake Ontario – a secure line of communication for troops – is entirely lost. Your Lordship may perhaps be disposed to doubt – whether the assistance now prayed for from the Government be conceded or not."[73] The grant was refused. There was also a second reason for the lack of official favour; namely, the large amount of American capital invested in the Welland Canal Company.

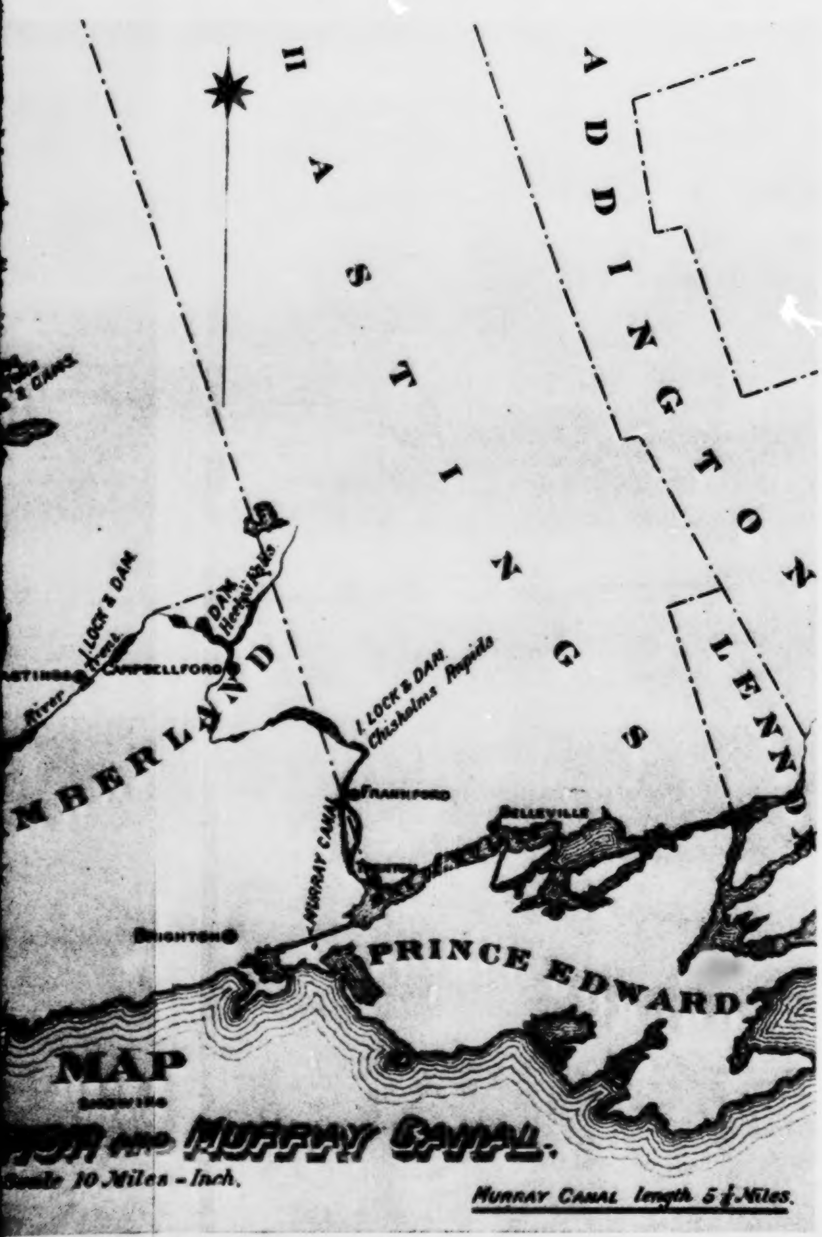
No sooner had construction commenced than both shareholders and colonial authorities began to pressure the company for enlargement of the proposed dimensions. The former urged that "We ought to keep in view sloop as well as boat navigation in order to render the stock valuable." The latter were disturbed that a 4-foot canal would be unable to accommodate gunboats and would not permit the movement of naval vessels from one lake to the other. In 1825 the Smyth Commission reported to the Duke of Wellington that the Welland Canal would "materially assist in the defence of this (the Niagara) frontier,"[74] provided it was constructed on a large enough scale.

It was now becoming apparent that for the smooth construction of the canal on an enlarged scale the company would require the cooperation of the colonial authorities. Such cooperation could possibly be achieved by giving the authorities more influence in company management. It was also hoped that some way might be found of "minimizing the threat of American influence without sacrificing the assistance of American capital." Application was therefore made to the legislature for a new charter and this was granted in April 1825.[75] This new Act of Incorporation allowed for an increase of capital to £200,000 and a new scheme was adopted providing for a canal of larger dimensions having wooden locks 110 feet long and 22 feet wide with 8 feet of water. The route of the canal was to be from Lake Ontario to the Welland River, which was to be utilized as far as the outlet into the Niagara River. Vessels would then ascend the swift current of the Niagara to Lake Erie. The canal was to be 26 feet wide at the bottom and 58 feet at the surface of the water except in the part through the ridge of land separating the two watersheds and known as the "Deep Cut" where there was to be a width of only 15 feet at the bottom. These dimensions would enable the canal to accommodate the schooners and sloops then navigating the lakes. By this time the lieutenant governor had become sympathetic to the scheme after the northern terminus had been shifted to the mouth of Twelve Mile Creek. Haunted by the fear of invasion, it seems clear that to the naval and military officers the major consideration was the construction of safe harbours and naval bases near the head of Lake Ontario and on Lake Erie and an inland line of communication between them.

It was expected that the canal would be formally opened for navigation in 1828, but on 9 November of that year the banks of the Deep Cut collapsed.[76] The cut was 1¾ miles long through clay resting on an insecure bottom. The engineers had excavated it to a depth ranging from 30 to 56 feet. In order to overcome the difficulties at the Deep Cut, it was decided to raise the summit land of the canal nearly 16 feet and take the supply of water from the Grand River by means of a feeder 20¾ miles long instead of from the Welland River. The feeder was itself a navigable canal being 5 feet deep and having a surface width of 40 feet. In order to raise the waters of the Grand River sufficiently to supply this feeder it was decided to

6 Map showing the Trent Navigation and Murray Canal. (*Annual Report, 1894-95*, Dept. of Railways and Canals.)

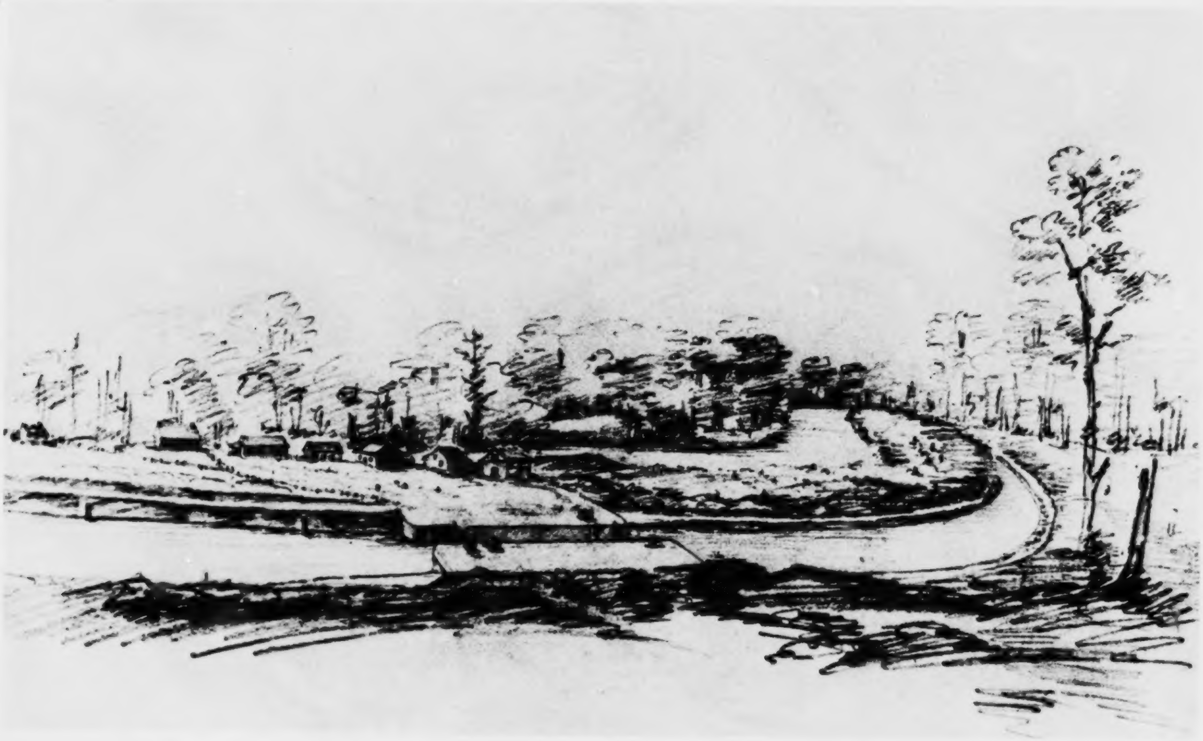



HASTINGS
ADDINGTON
LENN
NBERLAND
PRINCE EDWARD
2 DAMS
1 LOCK & DAM
Trent
River
STINGS
CAMPBELLFORD
DAM
Healey's Falls
1 LOCK & DAM
Chisholms Rapids
FRANKFORD
BELLEVILLE
MURRAY CANAL
BRIGHTON
MAP
SHOWING
AND MURRAY CANAL.
Scale 10 Miles - Inch.
Murray Canal length 5½ Miles.

7 The lock at the First Rapids, Rideau Canal, a pencil sketch by John Burrows, 1832. (*Public Archives of Canada.*)

8 Burritt's Lock, looking up, by John Burrows, 1832. The blockhouse is representative of defensive measures taken to protect the locks. (*Public Archives of Canada.*)

7



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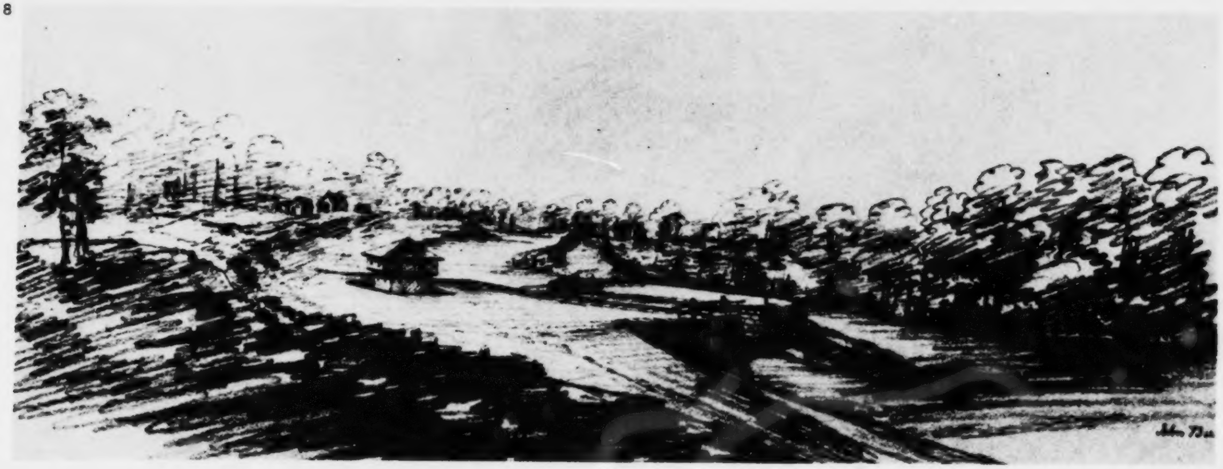


build a dam across it near the mouth. Changes in the route provoked objections. The most serious opposition came from the British naval commander, Commodore Barrie.[77] He was strongly against the proposed Grand River dam, arguing that it would destroy any possibility of using the estuary as a naval base. He insisted that the dam be constructed not less than 18 miles upstream. The company objected to lengthening an already lengthy feeder thereby adding greatly to the cost. Lieutenant Governor Sir John Colborne thereupon offered a compromise solution declaring that the dam be built not less than 2 miles upstream. The river was finally dammed five miles from the mouth and a cutting made from there to the feeder. After the slide at the Deep Cut work was pushed ahead rapidly and a year later the canal was formally opened. On 27 November 1829, two schooners, the *Anne and Jane* from Youngstown, New York, and the *R. H. Boughton* from York started through the canal from Port Dalhousie and after cutting through ice, in some places three inches thick, arrived at Buffalo on 2 December.[78]

Though two small ships had passed from one lake to the other by means of the canal, the directors were not satisfied with this partial completion of their plans. Due to the accumulation of ice, the portion of the Niagara River from the point where the Welland entered it to Lake Erie was not navigable for several weeks after lake navigation began. Moreover, the current of the Niagara was swift and vessels from the head of Lake Erie had to get around the Niagara peninsula, a considerable distance out of their way, to gain entrance to the canal. The directors therefore decided to connect the canal with Lake Erie at Port Colborne. In order to accomplish this task the capital stock of the company was increased to £250,000 and the government of Upper Canada gave a loan of £50,000.[79] The work was completed in March 1833. Altogether there were 40 wooden locks, the smallest of which was 110 feet long by 22 feet wide with a depth of 8 feet of water. There was now a direct line of navigation from Port Colborne on Lake Erie to Port Dalhousie on Lake Ontario, a distance of only 28 miles.

The abortive rebellions of 1837 led the imperial government to appoint Lord Durham as governor general of all British North America. Shortly after his arrival in Canada in 1838, Durham recommended to Lord Glenelg, the colonial secretary, that the canal system of the Canadas should be completed with the aid of imperial credit if necessary. To this suggestion Glenelg replied that though the imperial government could give no immediate pledge of funds for expenditure on Canadian canals, Durham was authorized to have a survey of the whole route from Lake Erie to tidewater made by a competent officer of the Royal Engineers.[80] Lieutenant Colonel Phillpotts, formerly chief engineer of the Cornwall Canal, was selected for the job.[81] He examined the Welland Canal and in his report of 31 December 1839, Phillpotts emphasized the canal's commercial value since he considered that its importance from a military and naval point of view was sufficiently obvious and had already been brought to the attention of the imperial government. He could not, however, refrain from remarking that:

> *I am of opinion that it will be very inexpedient for Her Majesty's Government to follow the limited plan of the Welland Canal Company as I feel quite satisfied that before the Canal could be completed according to that plan, the necessity of making the Locks large enough for steam navigation would become evident, even for commercial purposes: but in the event of its being required for military operations, in which point of view it must be more especially regarded if assumed by the Government, there cannot be a question on the subject.*
>
> *I have, therefore, as directed in my instructions, drawn up my Report with this view, as it is most important that in the event of any misunderstanding with the United States our vessels of war on Lake Ontario, which can be fitted out at Kingston without difficulty and to any extent, should be able to pass up to Lake Erie, where we have no Naval Establishment of any kind for the purpose.*[82]

And there the matter rested until the Act of Union of 1840, in joining the two provinces, effected an increase in their joint resources and thereby enabled them to deal comprehensively with their waterway problem.

VIII

The War of 1812 had shown that the St. Lawrence River, interrupted by rapids and forming part of the boundary between the Canadas and the United States, was both inefficient and highly vulnerable as a means of military communication between the two provinces. With the conclusion of the war it was realized that the navigation of the St. Lawrence from Lake Ontario to the sea needed to be improved. In 1817 the breadth of the military canals at the Cascades, Split Rock and Coteau du Lac was doubled and their depth increased to 3½ feet in order to admit Durham boats and large-sized *batteaux* capable of carrying 100 barrels of flour.

But even these improvements did not long meet the needs of the traffic. In 1831 the Royal Engineers' office in Montreal drew up a set of estimates of (1) probable expense to widen and reconstruct the several locks and canals at the Cascades, Split Rock and Coteau du Lac, and (2) probable expense to construct a set of new locks and line of canal parallel to those existing at these points.[83] In a letter dated 23 February 1833, the commissary general expressed his concern regarding some of the difficulties and problems relating to the canals on the St. Lawrence.[84] He pointed out that the military locks were situated between Lakes St. Francis and St. Louis but the whole of the navigation was full of obstacles and that these were only partially overcome by the locks which consisted of three at the Cascades, two at the Split Rock and three at Coteau du Lac, including the guard locks at each place, and with dimensions sufficient only to admit boats of 12-foot beam. He went on to say that at the Cedars there were several obstacles near the Coteau where the boats were towed up by horses or bullocks and for about 6 miles were obliged to unload half or more of their cargos which were conveyed in carts. These locks were badly or hastily constructed in the first place and were now in a dilapidated condition. The commissary general held that since the imperial government retained possession of the military locks it had the responsibility of maintaining them in good repair so as to keep the passage open and not interrupt communication between the two provinces. He felt that repairs on them should be as limited as possible at the same time providing for the security of the communication.

The imperial government retained control over the works at the Cascades and Coteau du Lac in order to insure the transportation of public stores and troops. However, in 1833 the propriety of such control was questioned by the Hon. John Macaulay, one of the commissioners of Upper Canada for the improvement of the St. Lawrence.[85] He felt that since the canals were now used chiefly for commercial purposes the imperial government would possibly relinquish control over them to the provinces provided a suitable agreement could be worked out for the transportation of public stores and troops. Moreover, Macaulay believed that these canals would be better managed by a civil than by a military board of directors. No transfer of ownership or control occurred, however, prior to 1841.

At the same time as the commissary general expressed his concern regarding the difficulties and problems relating to the canals on the St. Lawrence, the legislature of Upper Canada passed "An Act granting to His Majesty a sum of money to be raised by debentures for the improvement of the navigation of the St. Lawrence."[86] The Act stipulated that it was expedient to raise a sum of money by way of a loan for this purpose. The receiver general was therefore authorized to raise £70,000 by debentures. At the same time commissioners were appointed whose duty it was to obtain a survey or surveys and a plan or plans of improvements to be made in the navigation between Prescott and the eastern extremity of the province by canals and locks. The commissioners were to prepare estimates of expense, award contracts, and fix tolls on any finished part of the improvements.[87] Immediately following his appointment, one of the commissioners wrote on 27 February 1833 to Alexander Stewart in Lower Canada, a leading advocate in that province of the improvement of the river navigation, expressing his hope that the two provinces would act harmoniously together in this matter.[88]

The canals projected by Upper and Lower Canada at this time were planned under one direction and formed virtually a single scheme. The American engineer, Benjamin Wright, advised both provinces and J. B. Mills made the surveys. The plans called for canals of 9 feet depth throughout: locks 9 feet deep, 55 feet wide and 200 feet long. The gross estimates for the works in Upper Canada came to £350,000. The cost of improvements in Lower Canada was expected to total at least £235,782.[89]

As previously mentioned, the breadth of the canals at Cascades and Coteau du Lac had been doubled and their depth increased to 3½ feet in 1817. This improvement, however, did not long meet the needs of the traffic. In 1834, Mills, while in the employ of Lower Canada, submitted three plans all of which contemplated works on the north side of the river. The plan which Mills recommended called for the building of three short canals and the utilization of the two calm navigable stretches of water between the rapids.[90] The Lower Canada assembly approved the plan but no further action was taken at that time. In the following year Alexander Stevenson submitted a plan for building a canal at less cost on the south shore, and further plans for a south shore canal were presented in 1836.[91] But again nothing was done. The Rebellion of 1837 along with the financial depression at that time held up construction. Moreover, the imperial government appeared reluctant to encourage any improvements in the navigation of this vulnerable stretch of the St. Lawrence. In 1839 when Lieutenant Colonel Phillpotts made his report to Lord Durham, he conceded that a canal on the south shore would cost less than one on the north shore but he considered the former undesirable from a military point of view and therefore adhered to Mills' plan of 1834.[92] Here one is reminded of Smyth's criticism of By's suggestion regarding the improvement of the Richelieu River route. Apparently, "military engineers were suspicious of a canal which could not be defended in time of war."

IX

While still on the subject of canals and the defence of the Canadas, one might add more about the imperial government's attitude toward the construction of Canadian canals. At times the conflict between defence and convenience was difficult to resolve. The possibility of an American attack so permeated the thinking of military minds that some authorities were inclined to view with misgiving the construction of such necessary and beneficial works as the St. Lawrence, Welland and Chambly canals. But not so the Duke of Wellington. When giving evidence before the House of Commons select committee in March 1828 he was asked "what would be the probability of defending Canada if neither the water communication nor the works mentioned in these estimates were executed?" His reply was:

> *I should say that the defence of Canada would be impossible. I have never been in that country, but I must add that I have been astonished that the officers of the army and navy employed in that country were able to defend those provinces last war; and I can attribute their having been able to defend them as they did only to the inexperience of the officers of the United States in the operations of war, and possibly likewise to the difficulty which they must have found in stationing their forces as they ought to have done upon the right bank of the St. Lawrence.*[93]

In his strategic thinking regarding Canada, Wellington wrote off the offensive as being impractical and foolhardy. He hoped, however, that the improvement of the interior lines of communication would enable the British to pass both armed and naval forces from lake to lake asserting local superiority wherever they went.

Throughout this period the poor, underpopulated, and exposed communities of Upper and Lower Canada looked to the imperial government for military protection against the United States in the form of British garrisons and gunboats. British power was their one guarantee of survival against their aggressive, strong and confident neighbour. Like the military authorities, many of the people residing in the Canadas could not and dared not forget the War of 1812.

The impracticability of a major land attack across the rough terrain of the New Brunswick border coupled with naval superiority ensured to Britain command of the St. Lawrence as far as Quebec. Beyond this point, however, large warships could not navigate, while frigates could not reach beyond Montreal. By 1840 the improvements to the St. Lawrence canals permitted the passage of small steamers but not any useful warship. It was clear that in the event of hostilities the Americans were bound to cut the river certainly above Montreal and possibly below it by commanding the passage on the south bank if not by actual invasion. To the rear, of course, was the Rideau and Ottawa canal system but this was designed to carry military stores and troops and could pass only small gunboats. Britain's naval power, therefore, could not be brought to bear on the lakes. Reliance had to be placed on what could be done locally. It seems clear that Britain's principal weakness at this time in regard to the defence of the Canadas was due primarily to the great difficulty in overcoming distance.

Canals and the Commercial Development of the Canadas, 1791-1841

I

John Graves Simcoe, Upper Canada's first lieutenant governor (1792-99), believed that the St. Lawrence must be the great highway and transportation route into and out of the unexploited interior of the continent. He envisaged the bulky products of the interior flooding down to Montreal after having been exchanged for British manufactures in Upper Canada. At the time of Jay's Treaty in 1794, Britain, recognizing the impossibility of enforcing mercantilistic controls upon intercourse between the United States and Canada west of Montreal, agreed to reciprocal equalized customs duties. For a few years following the treaty large quantities of British and West Indian goods were sold in the lakes district, since transportation costs from Montreal to Kingston were about one-third of those from Albany to Oswego. Meanwhile, commencing in 1792, the state of New York started to build canals. Three years later the London merchant, Brickwood, reported that the Americans were improving their inland navigation by the Mohawk,[1] and in 1801 Sir Alexander Mackenzie warned that the New Yorkers were projecting a canal from Albany to Lake Ontario.[2] Mackenzie was opposed to English capital financing the projected American canals and he expanded upon the natural advantages of the St. Lawrence, at the same time suggesting ways and means of improving this waterway. Both men believed that the Canadas must construct an enlarged system of canals if they were to counter the American threat.

II

During the last decade of the 18th century, goods from Montreal destined for Upper Canada were carted to Lachine, the location of the first rapids. There the goods were loaded into *batteaux* for the river voyage to Kingston. Several *batteaux* usually left Lachine in company in order that the crews might combine their strength in pulling each boat up the rapids. At each rapid the *batteaux* were lightened and a portion of the goods carted to a landing above. A few men remained in each *batteau* to keep it away from the river bank while the others on shore towed it up the current by means of a rope fastened to the bow.[3] The standard of weight for merchandise was a barrel of rum, which cost from $3.00 to $3.50 to carry from Lachine to Kingston,[4] and this was the scale used in regulating the cost of transporting other goods.

The beginning of the 19th century found an increasing number of larger boats using the St. Lawrence. The "Kentucky" boat carrying between three and four hundred barrels of flour now appeared on the river between Kingston and Montreal. This traffic, however, found the existing canals antiquated and inadequate and the Canadian merchants became concerned about the weaknesses of their transportation system. By 1800 the imperial government had already authorized Gother Mann to inspect the canals and report on their condition:[5] as a result of Mann's report some improvements were made.

Upper Canada's trade was now rapidly expanding. The value of the province's exports for 1801 was estimated as amounting to £105,000 currency.[6] The total value of British imports from Canada for that year, one-third of which was made up of furs, was estimated as £600,000 currency.[7] At that time Canadian produce sold to the British government, as stores for the local garrisons, for example, was estimated at another £600,000[8] making £1,200,000 currency, for which bills could be drawn on Britain to pay for Canadian imports and other obligations.

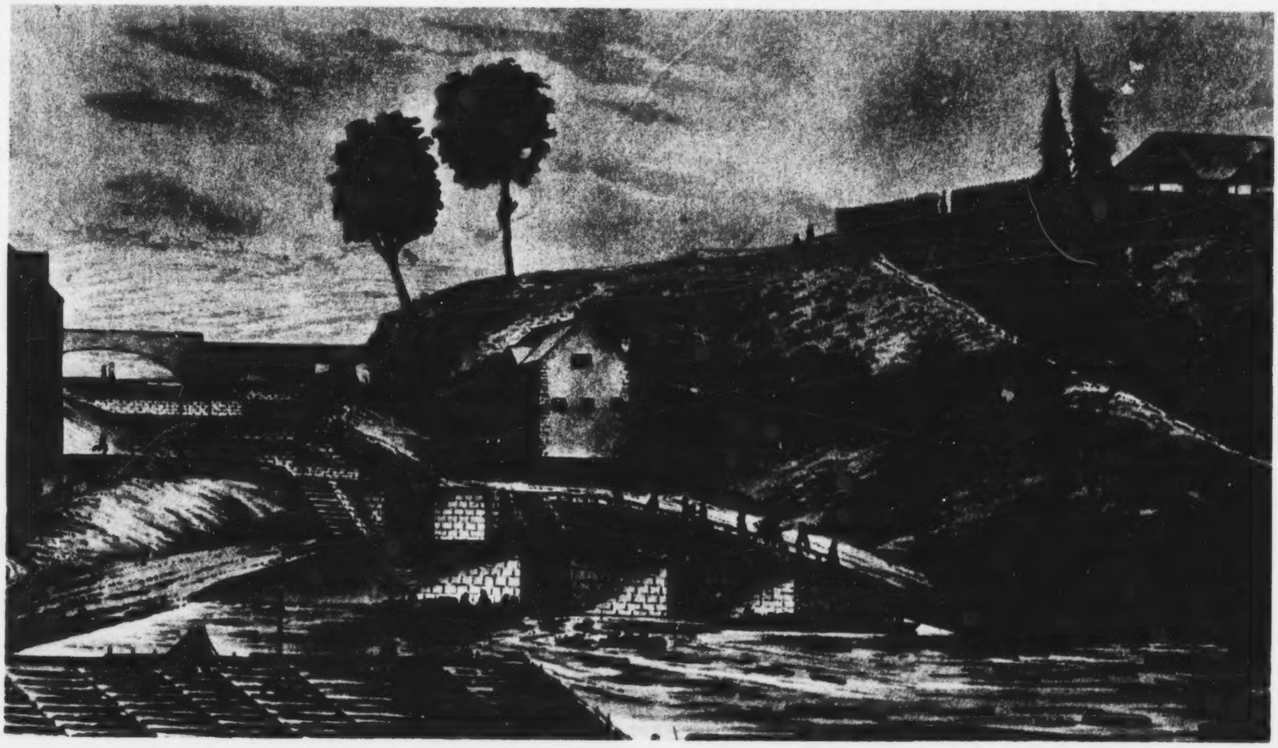
During the Napoleonic Wars Britain discovered that she needed all the lumber and grain that the British North American colonies could produce and attract from American ports. In 1807, therefore, an imperial statute permitted the entry to British colonial ports from the United States of wood products and naval stores. The products flowed from the American states through the British provinces to Great Britain and this flow increased after December 1807 when the American government, in applying the neutrality laws, placed embargoes on export and import trade. From this time on Britain maintained preferences for colonial timber, a steady supply of which was so important to a wooden navy and merchant marine.[9]

Until the opening of the Erie Canal in 1825 nearly the whole of the trade of the country bordering on the St. Lawrence, Lake Ontario and the upper lakes found its way to the ocean via Montreal and Quebec. And it is probable that it would have continued to do so had it not been for the construction of the Erie Canal which, by affording a safe and commodious inland water communication from Buffalo, secured to the Americans the transport of nearly all the products of the western country, thus depriving the Canadian provinces of the advantage they had previously enjoyed.

III

With the conclusion of the War of 1812, the fertilizing stream flowing from the British military chest dried up, and the provinces had to depend once more upon their own natural resources and their connection with foreign markets.[10] Fully appreciating the importance of canals to the agricultural and commer-

9 Entrance of the Rideau Canal at Bytown, a water colour by H. F. Ainslie, 1839. On the hill to the right is shown part of the barracks. The rafts in the foreground were used to float lumber down the Ottawa River. (*Public Archives of Canada.*)



cial development of the country, the provincial governments ordered investigations made from time to time into the cost of improving the water communication. We have already noted how in 1817 the breadth of the military canals at the Cascades, Split Rock and Coteau du Lac was doubled and their depth increased to 3½ feet in order to admit Durham boats and large *batteaux* capable of carrying 100 barrels of flour.[11] But even these improvements did not long meet the needs of the traffic. In 1818 the legislature of Upper Canada requested the co-operation of Lower Canada in an undertaking to improve the navigation of the St. Lawrence.[12] Both provinces appointed commissioners to consider the advisability of building canals above Montreal and the following year they presented a joint report.[13] Concern about the projected Erie Canal influenced their conclusions. The commissioners urged that the proportions of the Canadian canals and locks should be at least equal to those of the New York canal: that is, 28 feet wide at the bottom and 4 feet deep; locks 90 feet in length and 12 feet wide in the clear. No immediate action was taken, however. One prominent Upper Canadian, keenly interested in the navigation of the St. Lawrence, complained that when visiting in Lower Canada in the summer of 1821 he inquired after the Lower Canada commissioners and learned from one of them that they were really quite inactive and did not intend to become involved in a matter they knew nothing about and in which they were little interested.[14] Upper Canada, however, was vitally interested and in this same year (1821) a select committee of the assembly referred to improvement of the navigation of the St. Lawrence as "The great and indeed only efficient measure by which . . . a permanent relief can be afforded to the commerce of Upper Canada and the safe, easy, expeditious and economical exploitation of our staples to the markets to which we have had access."[15]

IV

We have already seen how prominent merchants like Adam Lymburner and John Richardson had, during the final decade of the 18th century, urged the construction of a canal at Lachine and how the project was left in abeyance due to lack of public support until the transport difficulties encountered during the War of 1812 impressed upon the government the need for improved communication with Upper Canada.[16] The navigation of the St. Lawrence from Montreal to Lachine, a distance of about 10 miles, was very difficult owing to the rapids and shallowness of particular parts. It was understood by all that the construction of a canal at Lachine would naturally facilitate the conveyance of stores to Upper Canada and supersede the expense and delay of a portage of nine miles.

In 1821 the legislature of Lower Canada appropriated £35,000 to the construction of the canal and, at the same time granted free passage to all boats of His Majesty's service on condition of an aid of £10,000 from the British government.[17] The first sod for the Lachine Canal was turned on 17 July 1821. Being considered "a work of great public importance and expectancy as well as forming an era in the improvement of internal navigation in the province, it was judged expedient that it should commence with appropriate form and ceremony."[18] On that day a group of people comprising the commissioners (appointed by the legislature to superintend the completion of the work), secretary, engineer, contractors, labourers, proprietors of land and others along with the band of the 60th Regiment, assembled at picket No. 18 to participate in the ceremony.[19] When completed in 1824 the canal was about 8½ miles long with 28 feet breadth at bottom, 48 feet at water surface through earth and 36 feet at water surface through rock. It was provided with 7 locks of cut stone, each 100 feet long, 20 feet wide and with 5 feet depth of water.[20] According to the governor-in-chief, the Earl of Dalhousie, the locks were of "the finest masonry I ever saw,"[21] and John Richardson, one of the commissioners, stated that "substance had been preferred to show."[22] Though opened in 1824, vessels did not pass through till 1825 since the shipping companies had previously contracted for the cartage of their goods over the portage for the year 1824. Once constructed, the Lachine Canal, "the only important project in the field of canal transportation undertaken by Lower Canada in the period before 1840," served as an important link both in the Ottawa-Rideau system and in the St. Lawrence route. Yet in time it came to be the bottleneck of the entire St. Lawrence system, carrying only 91,862 barrels of flour and 293,968 bushels of wheat during 1832 which was a better than average season.[23]

V

Throughout the 1820s an acrimonious debate went on between Great Britain and the United States with respect to the regulation of trade. Huskisson's Acts of 1822 and 1826 enlarged the scope of preference but ended for several years the previous arrangement for exporting American goods through the

St. Lawrence. The American government requested Great Britain to open the river from the lakes to the ocean to American vessels but this request was refused. Finally in 1827 imperial legislation once more opened the St. Lawrence to American export trade.[24] By that time, however, the subject of the navigation of the St. Lawrence had become involved in international politics. Americans now began to enunciate the right of the United States, based on appeal to "natural law," to the free navigation of the St. Lawrence from its source to its outlet. The Americans also held that free navigation of the river had been secured to them by treaty.[25]

The reception accorded in the Canadas to Huskisson's Acts disclosed the divergent economic interests between the merchants and the farmers. Commenting on the Canada Trade Act in 1822, the *Upper Canada Gazette and Weekly Register* declared that "the Trade Act, which exacts a duty of American produce, holds out great, nay every advantages to this Province." Later the Montreal *Gazette* of 18 May 1826, commenting on the several trade acts, declared that whereas Upper Canada had expressed approval of the legislation, Lower Canada had disliked the heavy duties on American lumber and agricultural produce. This newspaper implied that Lower Canada was united in its dislike of the legislation, though such was not the case. There, as in Upper Canada, the agricultural interests strongly favoured it. Memorials from agricultural interests in Lower Canada praised the Acts of 1825 for the protection they afforded Canadian agriculture against American supplies. "Even in the columns of the Montreal *Gazette* itself a correspondent pointed out that the urban population of Lower Canada numbered probably only 39,000 out of an estimated total of 400,000; and asked why Great Britain should oppress 361,000 farmers for the sake of the Canadian merchants."[26]

On 23 January 1826, the Montreal merchants held a meeting at which they expressed through a series of resolutions their dissatisfaction with the trade acts. Once again they enunciated their belief that the St. Lawrence was the natural outlet for the raw products of the interior of the continent. They complained that by placing duties on American flour at the inland port of entry and by prohibiting the importation of products such as beef and pork into the British possessions, the trade acts simply drove the produce of the interior down the new American canals.[27] However, modifications of the new trade laws were not long in coming. The imperial statute of 1826 permitted the importation into Canada of salted beef and pork duty free for exportation only to Newfoundland via the warehousing port of Quebec. Imported flour warehoused at Quebec enjoyed an imperial preference when shipped direct to the British West Indies while American flour, bonded through from the inland ports to Quebec, did not pay the regular duty. A further imperial statute of the following year (1827) admitted American timber, lumber, tallow, fresh meat and fish duty free when brought by land or inland navigation. Foreign produce could be warehoused at the free warehousing ports for exportation anywhere. Kingston and Montreal were to be the warehousing ports for goods entering Canada by land or inland navigation. American goods entered at western frontier ports could be bonded through without payment of duty. The Acts of 1826 and 1827 also laid down that timber, lumber and potash imported into Canada by land and inland navigation were to be deemed Canadian produce when imported into Great Britain. This meant that henceforth "some American commodities entered Canada duty free, others escaped the new tariff through the bonding system; and in addition there were a few important products which acquired Canadian status by the mere passage down the St. Lawrence."[28]

VI

Meanwhile there was considerable public discussion regarding the St. Lawrence navigation. The *Quebec Mercury* of December 1824 carried a letter to the editor expressing some of the views and intentions of a group of gentlemen who organized a St. Lawrence Association.[29] The association set itself the task of inquiring into the most feasible methods of improving the navigation of the St. Lawrence through the whole length. The members of the association were hopeful that the discerning inhabitants of the two provinces would zealously support such a measure. A few years later, the Montreal *Gazette* of 29 March 1831 quoted from a reprint of a circular on improvement of the navigation of the St. Lawrence River addressed to the members of the legislature of Upper Canada.[30] The circular was written by W. H. Merritt and dated at St. Catharines, 15 February 1831. Merritt maintained that this subject was the most important measure of all for the future welfare and prosperity of the Canadas. The unnatural division of Upper and Lower Canada deprived Upper Canada of a seaport town or commercial city and the province could increase neither in population nor wealth in proportion to its natural advantages until it enjoyed a free and uninterrupted access to the sea. A difference of opinion existed, however, as to the best method of effecting that object. Some contended that the Rideau Canal, then on the eve of completion, would remedy every convenience. Others asserted that a navigation between Prescott and Montreal, from the cheapness of its construction, would be preferable. Merritt pointed out that Lake Ontario was already connected with the Hudson River by the Erie Canal 208 miles long, 574 feet lockage and 4 feet depth of water. The Rideau route when completed would be over 200 miles long, over 500 feet lockage and 5 feet of water. The St. Lawrence, however, would be only 120 miles of artificial navigation containing less than 200 feet lockage; or, in fact, a canal of 37½ miles in length would connect Lake Ontario with the ocean. One objection raised against a ship canal was the inability of the province of Upper Canada, with her heavy debt, to complete it. Merritt estimated the cost based on surveys at £750,000. This sum he expected could soon be paid off by merely carrying the same quantity of merchandise and produce as was then transported on the St. Lawrence and charging the same tolls as on the Erie Canal: this even making allowances for the trade which would be diverted on the Rideau. Such a canal of suitable dimensions would make a seacoast of the inland lake shore. The route would then be used by the American Midwest, for no other could successfully compete with it. Merritt suggested that the province could undertake the project alone, using its credit to obtain the necessary money, and become the proprietor on the same principle adopted by New York state in constructing the Erie Canal. Or, should the province refuse to shoulder the burden, it could incorporate a company with a capital stock of £750,000 with individuals and provincial government subscribing to the stock. According to Merritt this improvement should have been commenced long since, and it was a reflection upon the intelligence and enterprise of the country that this had not been done.

Yet nothing was done till 1833 when the opening of the Welland Canal the previous year provided a stimulus to the improvement of the St. Lawrence below it. In that year Upper Canada passed "An Act granting to His Majesty a sum of money to be raised by debentures for the improvements of the navigation of the River St. Lawrence" (3 Wm IV, C. 18). The Act pointed out that it was highly important to the economy of the province that the navigation of the St. Lawrence should be improved and that it was expedient to raise a sum of money by way of a loan for this purpose. The receiver general was therefore authorized to raise £70,000 by debentures for this purpose. At the same time two commissioners were appointed whose duty it was to obtain a survey or surveys and a plan or plans of improvements by canals and locks to be made in the navigation of the St. Lawrence between Prescott and the eastern extremity of the province. The legislatures of both provinces now proceeded to obtain information and professional opinion in the matter. Two American engineers were asked to examine the St. Lawrence waterway and report on the practicability and the probable expense of improving it by means of canals. In April 1834 one of them wrote, "It is certain to my mind that with such a canal as I have projected along the St. Lawrence, and Welland Canal in good order, that all the products of the soil from all the upper Lakes can be carried to tidewater a good deal cheaper by this route than can ever be done by the Erie Canal or any other work."[31]

During this same year (1834) work was begun on the one major canal project undertaken in Upper Canada before the union of the provinces. The Cornwall Canal on the north side of the St. Lawrence extending from Cornwall to Dickinson's Landing was designed to avoid the Long Sault Rapids at the head of Lake St. Francis. In 1816 the legislature of Upper Canada discussed the matter of building a canal at this point, and two years later it was one of the subjects dealt with by a joint commission appointed by the legislatures of both provinces to report on the water communication of the upper St. Lawrence. Construction of canals on this stretch of the river, to be not less than 4 feet deep and to cost $600,000, was recommended. Yet nothing was done, though in 1826 the lieutenant governor submitted a report of Samuel Clowes' which outlined two plans, one for a canal with 8 feet depth of water and one for a 4-foot waterway.[32] In 1830 the town of Brockville, fearing that the Rideau-Ottawa system of canals would draw traffic away from the St. Lawrence and thus adversely affect the commercial life of the town, had a survey made for a canal around the Long Sault Rapids and pressured the legislature to take action in the matter.[33] In 1832, therefore, the legislature passed a resolution favoring the construction of a canal having 9 feet of water. Two engineers, Benjamin Wright and John B. Mills, submitted plans for the Cornwall and Williamsburg canals. The canals projected by the Canadas at this time were planned under one direction and formed virtually a single scheme: the plans called for canals of 9 feet depth throughout, 55 feet wide and 200 feet long. The gross estimate for the works in Upper Canada came to £350,000 and the cost of improvements in Lower Canada was expected to total at least £235,782.[34]

The legislatures of Upper and Lower Canada reacted differently to the proposed construction of these canals; this difference reflected the divergent economic interests of merchant and farmer. The Upper Canada legislature, controlled by the economically minded Tories, authorized the construction of the Cornwall Canal which was begun in 1834.[35] To finance the project the province floated a series of loans in London. The Reformers in the assembly, representing the agricultural interests, professed to be horrified by any such increase in the public debt and advised delay in construction of the canal.[36] However, the unsettled political situation culminating in the Rebellions of 1837, combined with the severe depression which set in at that time, made it impossible for the province to sell its bonds. Work on the canal was therefore suspended for some years and was not resumed until after the union. In Lower Canada, where agricultural and professional interests controlled the assembly, no action was taken in the matter. To the French Canadian debts were always burdens. One member of the commercial community speaking in the Lower Canada assembly declared, "The question was whether by borrowing we did not enrich ourselves."[37] Another prominent member of the Lower Canada commercial group wrote:

> *The apprehensions of the evils of a Public Debt . . . prevailing in Lower Canada appears to me unreasonable in the present case, for our money is not to be wasted in foreign wars, or in useless pomp and pageantry, but in the accomplishment of works of a general benefit from which an ample return is sure to be made, equal in a very few years to the reimbursement of principal as well as interest . . . the ideas of the evils of a public debt no matter for what purpose incurred continues to be a bugbear in Lower Canada.*[38]

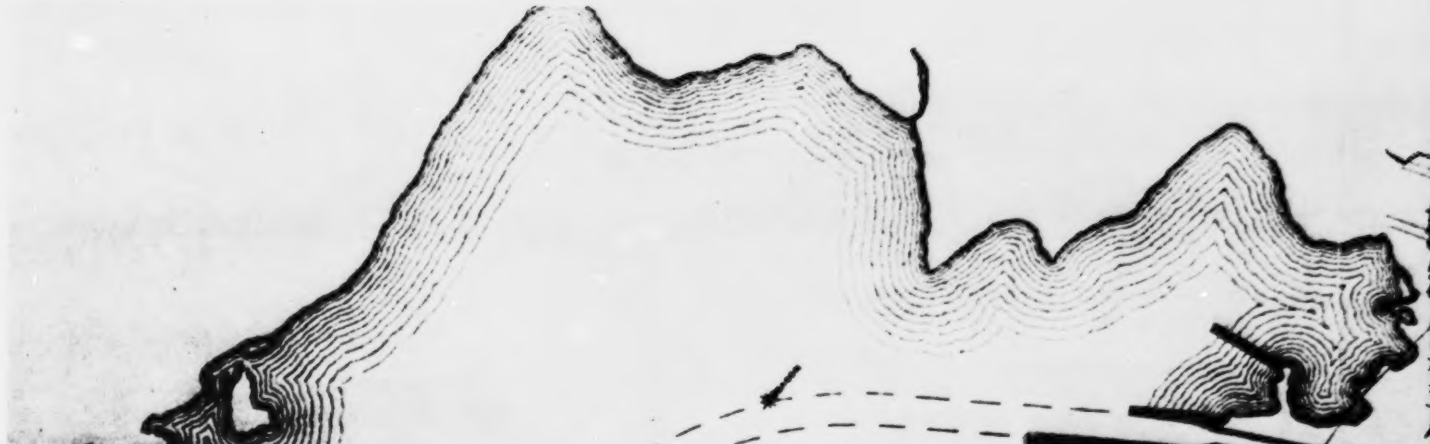
The Tory parties in both provinces closely connected as they were with the business community, advocated a policy of public works and the economic development of the country by private capital and public expenditure. One prominent Upper Canada Tory politician wrote to the civil secretary of the province in March, 1834, urging that the St. Lawrence canals must be pushed forward as the best security for his party's success in the approaching election.[39]

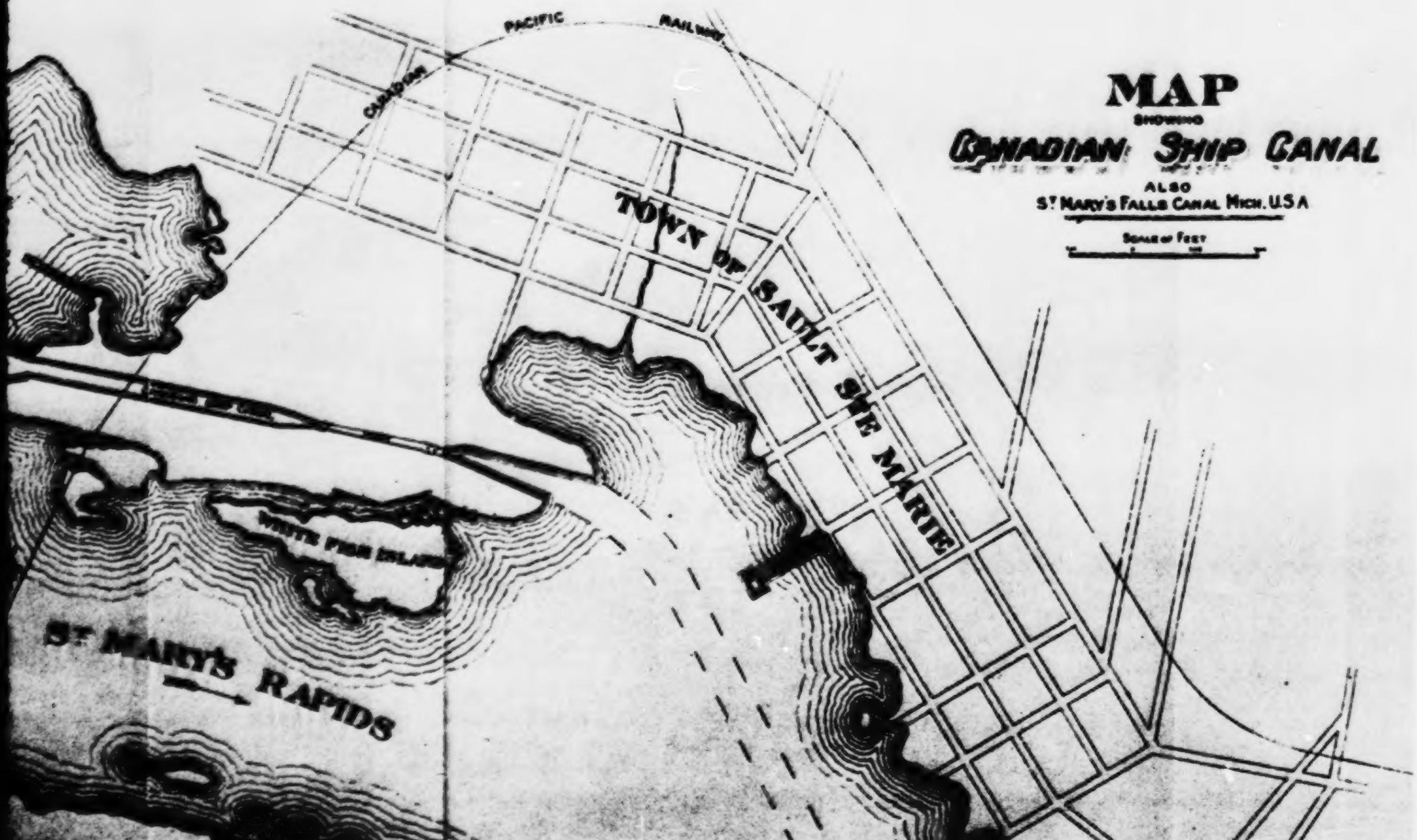
A new era in canal construction dawned with the arrival in 1838 of Lord Durham as governor general of the British North American colonies. Realizing that the commercial and agricultural depression helped to foment political unrest, he urged the British government to complete the St. Lawrence canal system.[40] At the same time Durham instructed Lieutenant Colonel Phillpotts of the Royal Engineers to prepare a report on the inland navigation of the Canadas.[41] In his two able reports on the subject, Phillpotts maintained that only the completion of a series of canals between Lake Erie and tidewater would assure prosperity to the Canadas. "Unless," he asserted, "we open an uninterrupted navigation *for large freight steamers* capable of carrying a cargo of at least 300 tons *without trans-shipment* before they arrive at Montreal or Quebec, we have no chance whatever of securing any great portion of that vast and important trade which must ere long be carried on between the Western States and the Atlantic Ocean."[42] He urged that the Welland and Lachine canals be enlarged to a depth of 9 feet and that the Cornwall Canal be completed as quickly as possible.[43] In conclusion Phillpotts strongly recommended the immediate construction around the remaining rapids on the St. Lawrence of a series of canals with the same dimensions as the Cornwall.[44] And there the matter of the St. Lawrence canals remained until the formation of the new Province of Canada in 1841.

VII

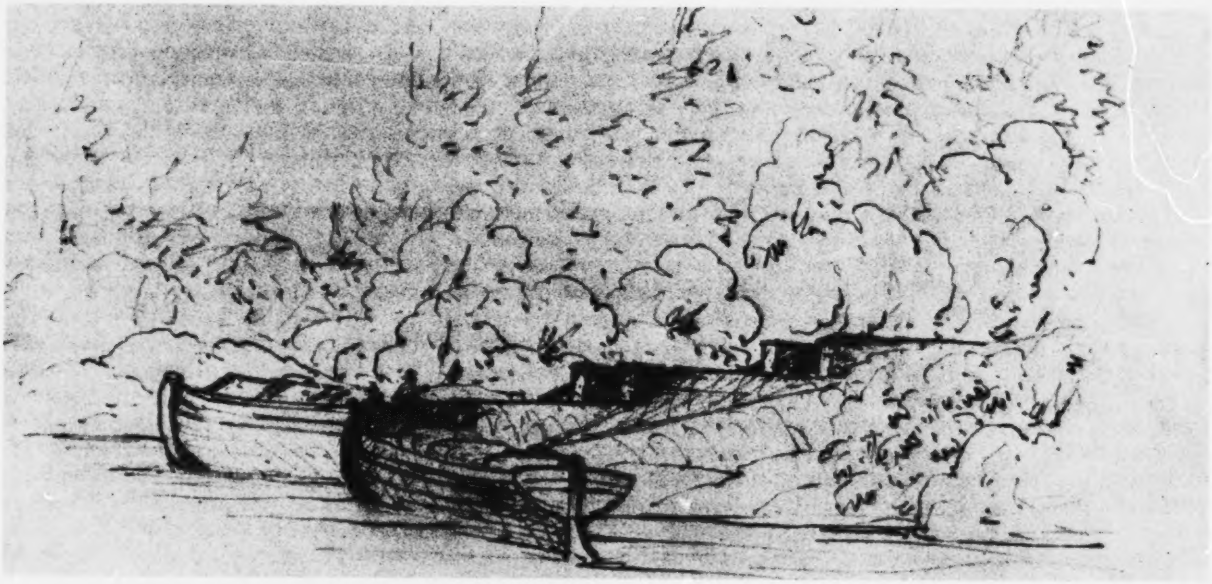
The years immediately following 1815 found Upper Canada deep in the throes of an economic depression. In 1821, therefore, an informed observer could write: "Most of the merchants have many large outstanding debts which, if collected by means of suits would ruin two-thirds of the farmers of the Province; and should the Montreal wholesale dealers have recourse to similar measures, many of their correspondents would become insolvent likewise."[45] Already in 1817 the Americans had begun to build the Erie Canal. This greatly alarmed the Upper Canadians for such a canal would in all likelihood divert much of the upper lake traffic to New York and away from the St. Lawrence route. The building of the Erie, however, fired the imagination of one Upper Canada business man, W. H. Merritt, who decided to emulate it by a canal based on the Welland River which would circumvent impassable Niagara. The Niagara peninsula, a neck of land 27 miles wide, separated the waters of Lakes Erie and Ontario and was a barrier to water communication between the upper lakes and the sea. Lake Erie was 300 feet higher above sea level

10 Map showing Canadian Ship Canal at Sault Ste. Marie; also St. Mary's Falls Canal, Michigan, U.S.A. (*Annual Report, 1894-95*, Dept. of Railways and Canals.)




MAP
SHOWING
CANADIAN SHIP CANAL
ALSO
ST MARY'S FALLS CANAL MICH. U.S.A
SCALE OF FEET
CANADIAN PACIFIC RAILWAY
TOWN OF SAULT STE MARIE
WHITE FISH ISLAND
ST MARY'S RAPIDS

11 Locks of the Rideau Canal near Ottawa, a pencil sketch made by H. J. Warre about 1840, showing the type of boat used at that time to transport goods through the canal. (*Public Archives of Canada.*)



than Lake Ontario, and the two were connected by the Niagara River with the falls marking the difference in level. It took Merritt from 1818 to 1829 to effect construction of an artificial waterway connecting the two lakes. But still more was required and in 1830 it was decided to undertake the construction of a new section of the canal which would provide a direct entrance to Lake Erie. This new extension would avoid relying on the dangerous and inconvenient navigation of the Welland and Niagara rivers. In 1832 work was pushed forward on a direct cut to Lake Erie which was completed by March 1833. There was now a direct line of navigation from Port Colborne on Lake Erie to Port Dalhousie on Lake Ontario, a distance of 28 miles.[46]

A line of boats was now organized to make daily trips between Grand River and Port Dalhousie. The Welland Canal Company announced that "an effort will be made in ensuing season to procure a sufficient number of vessels to leave Prescott every day if not oftener for Port Dalhousie, thence to Sandwich, touching at the intermediate ports on Lake Erie."[47] Such measures were an attempt to deflect the lake trade away from the Erie Canal and the Niagara portage.

The Welland Canal, however, never really enjoyed "a high volume of remunerative traffic." In the early years, lake shippers showed a lack of confidence in the canal. Mishaps, malicious rumours and lack of adequate credit and transportation facilities on the line of the canal discouraged Lake Erie forwarders from patronizing it. Upper Canada commercial centres along the canal, like St. Catharines, "could not compete with the commercial credit extended by Buffalo mercantile houses backed by the resources of the New York market."[48] Moreover, there was at first a lack of vessels designed for the double voyage on the lakes and the navigation of the canal. It seemed that the Welland would not be able to break the Erie's monopoly of the Ohio trade.

Yet the canal did bring in some revenue. During its first two seasons tolls amounted to £3,667 and the company stated hopefully that "the increase alluded to is entirely exclusive of the New York trade, scarcely a ton of which passed this route last season [1831]. The transit is wholly from Upper Canada and to and from Oswego – principally wheat down and salt up. This trade is confined to Lake Ontario; and from the number of superior flowing mills recently erected at Oswego cannot fail of increasing to an immense extent."[49] It was hoped, however, that once the Lake Erie cutting was completed and the direct Lake Erie line was open, there would be an increase in American traffic. In 1832 traffic increased somewhat, a significant feature being an increase in wheat from American ports amounting to 100,000 bushels.[50]

Upward traffic was principally salt, 35,000 bushels of which passed through the canal during the year.[51] The next few years witnessed an encouraging increase in traffic. Whereas tolls in 1833 totalled £3,618, in 1834 they increased to £4,300 while a total of 570 schooners, 334 boats and scows and 66 rafts passed the canal. In 1833, tolls were paid on 9,611 barrels of pork and 30,942 feet of square timber whereas in 1834 toll was collected on 23,422½ barrels of pork and 392,055 feet of square timber.[52]

The Grand River Navigation Company, active in developing the western part of Upper Canada, was responsible for part of the increased traffic.[53] Part of the increase also represented the Welland attracting some of the Ohio-New York trade. "Of the 264,919 bushels of wheat which passed the canal during 1834, only 18,464 came from Canadian ports on Lake Erie; the remaining 246,455 bushels came from American ports and of these 234,285 were consigned to the New York market by way of Oswego."[54] Actually the Welland did more to swell the traffic of Oswego (and New York) than that of Montreal, since the route from Lake Ontario by the Rideau Canal and the Ottawa River was roundabout while the passage down the St. Lawrence from Lake Ontario to Montreal, even with canals at the most difficult parts, was risky for men, boats and cargoes. Equally encouraging in relation to increased traffic was the fact that by the end of 1834, Canadian and American shipyards were constructing new vessels designed specially for the Erie-Ontario trade.

By this time it was clear that the Welland Canal stimulated the development of the country adjacent to it. The canal spurred on the inhabitants in the more remote areas to improve the rivers and streams flowing into Lake Erie in order to avail themselves of the advantages afforded by the canal. This improvement in the more remote waterways tended to create new sources of trade.

The 1835 season witnessed a threefold increase over the previous year in the amount of produce passing the canal and an increase in the tolls from £4,300 to £5,807.[55] However, the outlook for the canal was far from cheerful. Repairs and improvements were needed but the company had no funds. In 1835 and again in 1836, the directors resorted to printing their own money in the form of promissory notes redeemable in one year, in order to finance temporarily the operation of the canal.[56] But

this was not enough. An interruption in the flow of government assistance in 1836 resulted in the canal being closed for 93 out of 184 working days when it should have been open for navigation. After being in use for nearly a decade the wooden locks were, in 1837, rapidly decaying and required immediate replacement. "Stopgap aid, humbly petitioned for by the board and grudgingly granted by small minorities in the Assembly would no longer suffice. What was required was nothing less than a complete reconstruction on a permanent basis."[57] In 1837 the legislature passed an Act which converted all previous loans into stock. The Act also provided for an additional subscription for the completion of the canal in a desirable manner with stone locks and also for a complete survey of the canal by two competent engineers.[58] N. H. Baird and H. H. Killaly were appointed to make a complete survey and they submitted a report in 1838.[59] They recommended no drastic changes in the plan of the canal but only enlargements, the total cost of which was estimated at just over £300,000.

It was about this time that the imperial government intervened. As already noted, Durham selected Phillpotts to make a survey of the inland navigation from Lake Erie to tidewater. In his first report dated 31 December 1839, Phillpotts strongly recommended that the Welland Canal should be reconstructed with stone locks on a much larger scale. Wishing to emphasize the commercial value of the canal, Phillpotts urged that enlargement was essential and must not be postponed.

> *It is quite impossible, in the present state of the work, to ensure the navigation being kept open much longer unless the whole canal be immediately put into an efficient and permanent state of repair – if permanent and efficient measures be not adopted without delay, there is great danger that this highly important communication will soon become impassable.*[60]

By now the canal was in such poor condition and capital was so desperately needed that the director of the Welland Canal Company recommended that serious thought should be given to the abandonment of the canal as a navigable waterway and use it as a source of water only. With the formation of the new Province of Canada in 1841, the canal was placed under the direction of the Board of Works and in September of that year the legislature voted £450,000[61] for the canal's reconstruction and enlargement. At the same time the New York stockholders of the old Welland Canal Company were compensated for their investment in what they described as a "public work which for usefulness and profit, under proper management, is not equalled in America."[62]

VIII

We have seen how the Upper Canada legislature believed that the Ottawa-Rideau route could never compete commercially with the St. Lawrence. We have also seen how Colonel By believed the exact opposite, and how when planning the Ottawa-Rideau waterway he was moved by commercial as well as military considerations. On 13 July 1825, By recommended the creation of an uninterrupted steamboat navigation from Quebec to Lake Superior by enlarging the locks so as to allow the passage of steamboats then being built for the navigation of the Great Lakes.[63] Use of such vessels, measuring from 110 to 130 feet in length and from 40 to 50 feet in width and drawing 8 feet of water when loaded, would, By believed, give Britain possession of the trade on the borders of the lakes and completely nullify the strong efforts the Americans were making to dominate the trade by constructing canals. The lakes area, with its dense population, could then serve as a great outlet for British manufactured goods.[64] Moreover, during this period the commercial intercourse between Upper and Lower Canada via the St. Lawrence meant passing through waters over which the Americans claimed jurisdiction; the navigable channel of the St. Lawrence in the neighbourhood of Cornwall. By hoped that the Ottawa-Rideau waterway would prevent the critical trade between the two provinces from getting interrupted by the Americans.[65]

With the opening of the Rideau Canal in 1832, inbound cargoes used this waterway to the lakes from the St. Lawrence and Ottawa, and only outbound cargoes followed the risky route down the rapid stream of the St. Lawrence with its small inadequate canals. A heavy traffic now developed over the Ottawa-Rideau waterway between Kingston and Montreal. Forwarding companies were formed to engage in the trade. One of these was McPherson and Crane (the Ottawa and Rideau Company) which at one time ran a line of 13 high-pressure steamers along with barges and *batteaux* between Kingston and Montreal. This company owned a private lock at the mouth of the Ottawa River, thereby overcoming the dangerous navigation at that place and enjoying a monopoly of the towing business till 1841, when Captain R. W. Shepherd in the steamer *St. David* discovered a safe channel through the rapids at Ste. Anne.[66]

The construction of the Rideau Canal assisted in opening up Montreal's hinterland, thereby increasing the trade of that commercial centre. The mid-1830s found Lower Canada preparing for a substantial increase in trade notwithstanding the disadvantages of a periodically closed navigation, the distance of Quebec and Montreal from the sea, and the risk of delay and damage by ice in the Gulf of St. Lawrence. Large stores were built in Montreal and wharfage for boats and sea-going vessels was greatly extended. These operations and hopes of increasing commerce were partly encouraged by the rapidly increasing population and production of Upper Canada and partly by the new channels of communication opened up by the Welland and Rideau canals between Lower Canada and the American states bordering on the Great Lakes.[67] As the *Toronto Recorder* pointed out in 1836, "It has been proved last season that the goods from Montreal can be delivered at Toronto in five days by way of the Rideau Canal at an expense of two pounds ten shillings per ton with a certainty of two and probably only one trans-shipment."[68]

Moreover, the Rideau Canal played a part in the beginning of an export trade in Canadian products to the United States. Prior to the 1830s "all exports to the United States had been merely British goods in transit."[69] Contiguous Canadian and American territories produced the same products and there was little trade between them. However, with the rapid increase in population and the disappearance of the forest in the United States, Canada was drawn on for supplies of food and wood. A second market began to develop as the following two documents indicate. In June 1835 the Montreal *Gazette* printed the following excerpt from the Quebec *Gazette*.

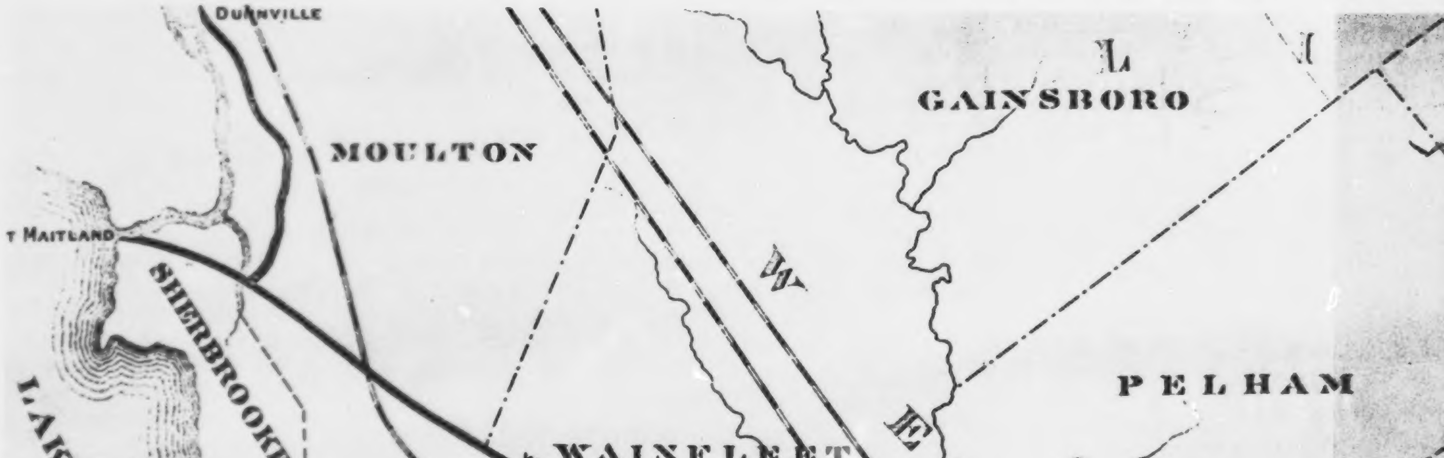
> *United States traders have this year come into Canada, bought up wheat, flour, provisions and lumber, and paid heavy duties on their transport out of this country. We believe that the rise in the prices which warranted these experiments was more speculative than founded upon scarcity. Although scarcity to some extent exists, in the great producing countries of the West, where extensive emigration has lately turned exports to westward instead of eastward. The progress of emigration to the West is this year almost unprecedented.*[70]

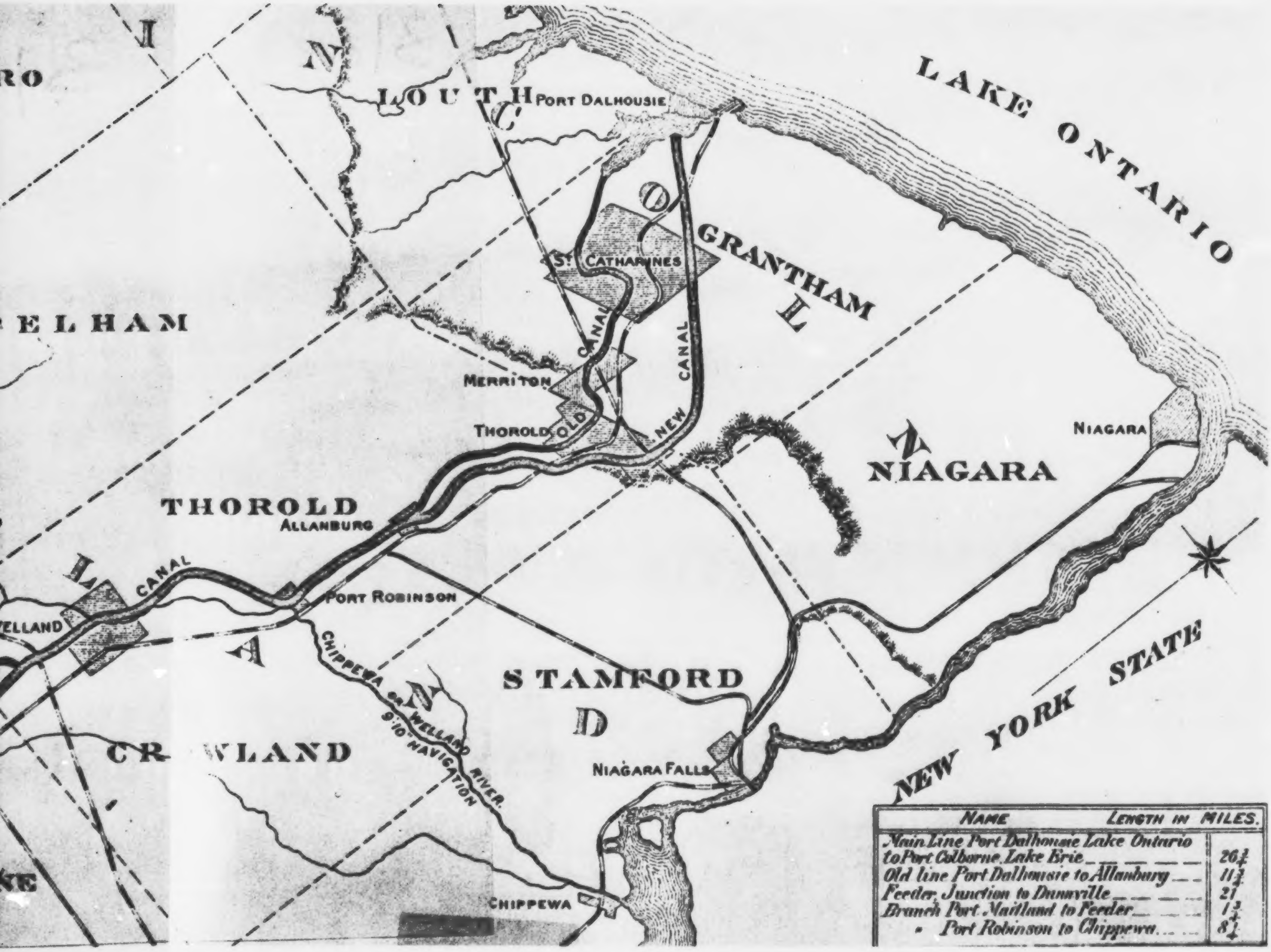
A year later in May 1836 the same newspaper carried the following excerpt from the Kingston *Herald*.

> *A vast quantity of lumber has been prepared on the Ottawa River for transportation by the Rideau to Oswego and New York. Two gentlemen alone have two millions of feet ready for the American market by this route; and a new steamboat is nearly built at Smith's Falls which is specially designed to convey this lumber to this town from which it will be shipped in schooners for Oswego. The Kingston Stave Forwarding Company have engaged two schooners to bring these staves from the different ports on Lake Erie by the Welland Canal, to their wharf at Garden Island; these and other schooners will take lumber from this port to Oswego; and from thence to the upper lakes. Hence by carrying freight along the whole route they will be able to reduce the rates, and the public will be doubly benefitted – by an increase of trade and a reduction of expense. Thus besides the other benefits of the Rideau Canal, it is opening an entire new trade to this part of the Province, and will render the immense pine forest on the Ottawa, available for supplying the demand from the States. The prosecution of this new trade becomes doubly important as it is almost certain that the British Ministry will reduce the duties of Baltic timber next year. Besides lumber, we are also sending grain of different kinds to Oswego; as oats, barley, pease of which two or three schooner loads have gone already and more are to follow.*[71]

However, a few years later Colonel Phillpotts, while viewing the Ottawa and Rideau canals as being most useful from a military point of view, "and in the event of war with the United States they would be invaluable," considered that commercially these canals were of little use. He believed that they were too circuitous and too impeded by lockage to compete with the American canals for the trade of the western states. He pointed out that some of the locks in the Ottawa canals "were too small for steamers and even if they were enlarged to the size of the Rideau locks they would be altogether too small for the steamers which navigate Lake Ontario and the Upper Lakes and therefore a trans-shipment at Kingston would be necessary."[72] Though the military expert like Phillpotts might consider the Rideau Canal to have little commercial value, this view was not shared by the inhabitants of the province, who considered it to have great value, both military and commercial. Possibly no better expression of Upper Canada public opinion regarding the Rideau Canal can be found than that contained in a resolution passed at an agricultural meeting held at Richmond Hill in the Home District on 9 December 1840, to the effect "that the people of Upper Canada . . . considered the construction of the Rideau Canal at the expense of the British Government as a most valuable boon conferred upon them and a mark of the deep interest their Sovereign took in their welfare."[73]

12 Map showing line of Welland Canal between Lakes Erie and Ontario indicating feeder line from Port Maitland. Also indicated is the line of the old canal from Port Dalhousie to the Niagara River via the Welland. (*Annual Report, 1894-95*, Dept. of Railways and Canals.)



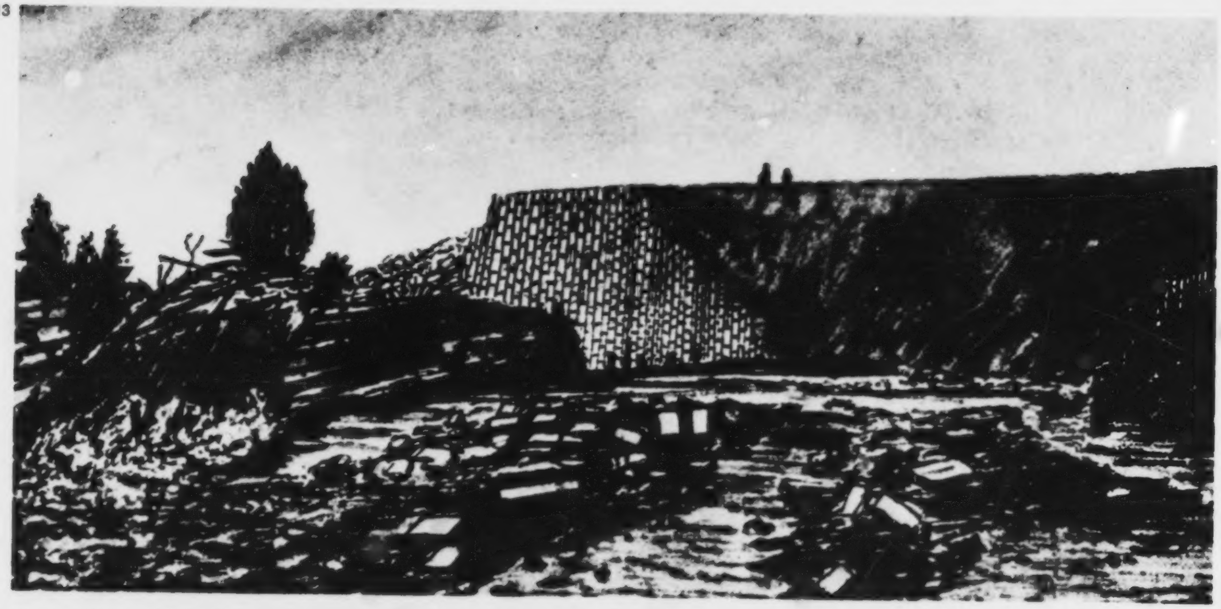


NAME	LENGTH IN MILES.
Main Line Port Dalhousie Lake Ontario to Port Colborne, Lake Erie	26¼
Old line Port Dalhousie to Allanbury	11¾
Feeder, Junction to Dunnville	21
Branch Port Maitland to Feeder	1¾
" Port Robinson to Chippewa	8¼

13 Dam at the Hog's Back, showing the breach in the stone work when the dam was under construction in 1830. Sketched in 1845 from the bed of the river by Capt. Thomas Burrowes. (*Ontario Provincial Archives.*)

14 View from the entrance to the first eight locks of the Rideau Canal, 1848, by C. E. Ford. Note the side-wheeler to the right of centre. Other vessels used in river travel are also shown. (*Public Archives of Canada.*)

13



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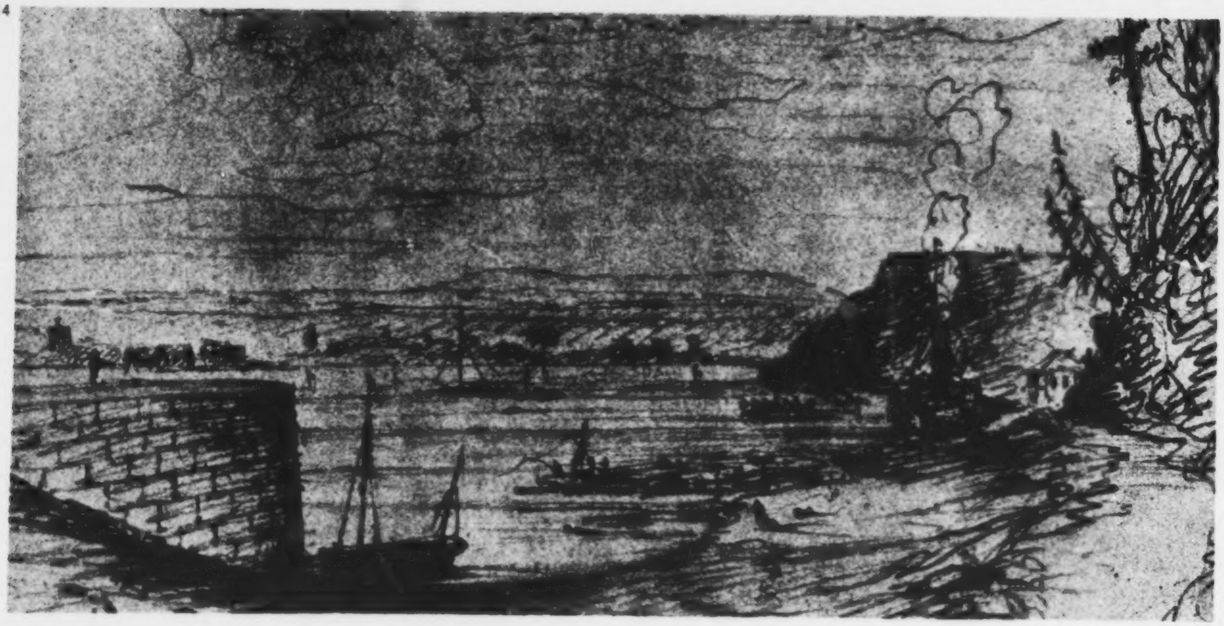


IX

Something must here be said of the relationship of the provinces of Upper and Lower Canada to the British imperial trading system, for upon that relationship depended to some extent their existence as viable communities.[74] A new country enjoying abundant natural resources must be able to market its natural riches to progress economically. The principal products of the Canadas, indeed nearly the only products at this time, were wood, grain and, to a lesser degree, potash. The economic structure of the Canadas in the period under review was largely dependent on these commodities. The Canadas enjoyed a protected overseas market for these products due to the British preferential duties on colonial timber and grain.

During the Napoleonic Wars, wood had become the Canadas' most valuable product and came to form nearly two-thirds – amounting in 1834 to £784,457[75] – of the value of exports to Great Britain whose taxpayer actually subsidized Canadian timber. So high were the differential duties on timber that Baltic timber was shipped to British North America and then reshipped to Britain since anything that touched colonial soil became colonial and was entitled to the preference. A fierce battle of vested interests in Great Britain waged about the colonial preference on timber lasting from about 1820 to 1846. Supporters of Baltic timber demanded abolition while the colonial interests insisted on continuance. The following account of a debate in the Upper Canada legislative assembly on 4 February 1831 presents the standard arguments against the repeal of the differential duties.

On motion of Mr. Morris the House went into Committee on certain resolutions respecting the Timber Trade. Mr. Morris said, . . . "The Imperial Parliament are about to alter the duty on Baltic Timber. . . . Any material change affecting the Timber Trade of the Canadas will cause its utter ruin and the bankruptcy of many persons who have embarked their fortunes with a confident belief that no sudden change would take place. . . . The expensive voyage to Canada, and the high rate of wages to labourers and seamen put it out of the power of the Canadian merchant to compete with the Baltic trade, unless some protection is afforded. . . . The importance of this trade to the Empire ought to induce His Majesty's Government to listen with caution to representations (as to the repeal of the duties) which would drive 700 ships out of a trade that employs thousands of British seamen and causes the consumption of vast quantities of the manufactures of our countrymen, and thereby gives employment to foreigners." Another advantage of the trade with Canada he thought to be the means of removing vast numbers of emigrants to the Colony, who could not leave home but for the cheap passage afforded by the ships arriving at Quebec in ballast. These persons became respectable settlers and thereby relieve the nation of a serious burthen. It has been argued that the lumber trade was an injury to the country as it diverted the farmer from agricultural pursuits; but this opinion he could by no means agree with. The thousands of persons employed in that business consume vast quantities of the flour and pork sent from the western parts of the Province and are the means of introducing an extensive circulation of money which could not otherwise exist.[76]

The Canadian timber industry at first developed in the form of square lumber both "because of the habit of the British market and because little fixed capital was necessary for getting it out."[77] Later there grew a demand for sawn lumber and this developed as a second branch of the industry.[78] Sawn lumber meant the construction of mills built along the main waterways since they had to ship by water in the export trade.[79] In the mid-1830s traffic in sawn lumber began in the United States though on a much smaller scale than in Great Britain. Some lumbermen turned to the milling of cheaper boards and planks for American sale and this Canadian lumber was exported to the United States via St. Johns on the Richelieu, Kingston on the Rideau Canal route, or through the Welland to the Erie Canal.[80] And while Canadian mills were beginning to produce for the American market, American lumber interests were starting to seek Canadian timber limits.[81]

The second major export product of the Canadas was grain. In this respect the British Corn Law of 1826 admitted Canadian grain exports to the British market upon payment of an import duty below that levied against foreign foodstuffs.[82] It was found, however, that notwithstanding this preference, at times Canadian grain could still be kept out of the British market due to high transatlantic shipping costs, poor Canadian harvests or low British prices. In 1830 the merchants of Quebec and the directors of the Welland Canal joined in proposing a radical reduction of duties on American wheat, grains and salted provisions brought into Canada by land or inland navigation.[83] The following year they got even more than they had asked for. The Canadian Trade Act of 1831[84] allowed American wheat and flour to be admitted duty free to Canada for export via the St. Lawrence to markets over-

seas. American wheat could now be milled in Canada and qualify as Canadian flour. This piece of legislation, combined with improving world economic conditions after 1837, proved a boon to the St. Lawrence grain trade. It was estimated that in 1831, 81,144 barrels of flour were exported from Quebec of which 41,856 barrels had come from the United States by inland navigation.[85] Three years later the Welland Canal carried 22,170 bushels of wheat to Montreal from American ports along with 18,464 bushels from Canadian ports.[86] And in 1835 the Welland carried 18,[illegible]7 bushels of wheat shipped to Montreal from the midwestern United States.[87] Moreover, by 1839, 249,471 bushels of wheat, compared to 99,377 bushels in 1829, passed out of the St. Lawrence for markets overseas, and the following year the number had increased to 1,739,139 bushels.[88] It was expected that this increase would continue. Such a rapidly increasing traffic put a severe strain on the existing inadequate St. Lawrence navigation and made improved canalization of the river above Montreal an absolute necessity; all the more so if the St. Lawrence route was to meet effectively the competition of the American Erie Canal route. For in 1834, at the same time as the Welland Canal carried 40,634 bushels of wheat for Montreal, it also carried 224,285 bushels for the American port of Oswego on Lake Ontario.[89] And while the Lachine Canal carried 91,862 barrels of flour and 293,968 bushels of wheat in 1832, "in 1834 which was a relatively poor year, 977,027 barrels of flour and 748,433 bushels of wheat were transported by the Erie Canal to tidewater."[90]

The third major Canadian product for export was potash. Potash and pearl ash were by-products of clearing land for settlement. The hardwood which stood on fertile land was burnt and the potash and pearl ash extracted from the ashes. As seen in the following excerpt from the Montreal *Gazette* of 17 January 1824, this product was exported in large quantity.

> *The articles of ashes which now forms perhaps the staple of the country exceeds in 1823 that of the year preceding by a very large amount, viz: 76,603 cwt. which taking for both kinds, the average price of 30 s. per cwt. would give an excess in the value of the exports of 1823, above that of 1822, of £115,205; applying the same average price to the export of the article we should have a capital employed in that branch of our trade of £327,511. It is indeed probable from the unusually high price of ashes last winter, that more than this amount has been engaged in the trade, and that £350,000 has been employed, a sum somewhat less than half the whole value of merchandise imported in the same year. This profitable part of our trade we owe in a great measure to the free admission of the article from the bordering States, which is perhaps one example of the advantages of unrestricted trade between the colony and our neighbours.*[91]

The few years preceding the union of 1841, therefore, witnessed a commercial revival in the Canadas. There was noticeable improvement in trade and an increase in real estate values. There were good markets abroad for Canadian primary products, exports of which from Montreal and Quebec in 1841 were valued at over 2 million pounds, in which sum were included 356,210 barrels of flour and 562,862 bushels of wheat.[92] This flourishing export trade was reflected by a rise in the tonnage of vessels clearing outward from Quebec from 354,739 in 1838 to 478,906 in 1840.[93] At the same time there was a steady increase in traffic and tolls on the Lachine and Welland canals while the ports above Montreal were blocked with supplies of wheat and flour pouring in from the United States.[94]

The provincial finances, however, were in a less flourishing condition. The unfinished or imperfectly completed public works had been suspended for lack of funds. The interest on the loans made for such public works almost equalled the revenue of Upper Canada.[95] Such revenue being derived principally from a low tariff was inadequate. It was estimated that in the last year before the union the combined provincial deficits equalled nearly £66,000.[96] Canadian credit was shaky on the London market. "The two provinces went into union with an inadequate revenue, a broken credit and a combined debt of £1,325,000 currency."[97]

It would appear then from what has been said that prior to the union of Upper and Lower Canada in 1841, canal construction served as a measure to promote both military defence and economic development in the provinces. However, as already pointed out, one can detect throughout the period a certain conflict of interests in regard to canal construction between the imperial government, preoccupied with the problem of defence and the survival of British power in North America on the one hand, and the political and commercial interests involved in regional economic development on the other. Each side tended to regard the construction of canals from its own point of view. Sir James Carmichael Smyth stoutly rejected for military reasons the opening of the Richelieu River by enlarged locks to allow steamboats to enter Lake

Champlain and thereby secure for Quebec the commerce from that part of Canada and of the United States bordering on the lake.[96] The military authorities vetoed the construction of the Beauharnois Canal on the south shore of the St. Lawrence though it would cost much less to construct it there than on the north side.[99] Moreover, the military authorities were of two minds about the Welland which allowed naval vessels to pass from one lake to the other.[100] On the other hand it was located on the Niagara peninsula which lay exposed to invasion from the United States.[101] The military authorities continued to retain control over the small canals on the St. Lawrence which the commercial interests believed should be handed over to civilian control for better management.[102] One prominent commercial man wrote in 1833:

> *The propriety of the Military works at the Cascades and Coteau du Lac being given up to the Province . . . Government can surely have no desire to retain Military control over the works on the St. Lawrence provided a suitable agreement can be made for the transportation of public stores and troops, and it is very certain that Canals intended for commercial purposes chiefly will not be so well managed by Military as by a Civil Board of Directors.*[103]

Two years later, in March 1835, a memorial of forwarders, engaged in the carrying trade on the St. Lawrence between Upper and Lower Canada, was sent to the governor-in-chief, Lord Aylmer stating

> *That in order to attract the produce of the Western States of America, and the distant shores of Lake Erie to the provincial markets and the transmission of goods from these markets to those distant shores, your memorialists have reduced the freight inwards and outwards more than fifty per cent whilst the passage through the Government Locks has been increased forty per cent as if every relaxation on the part of your memorialists to benefit the Country and its Commerce met a counter effort on the part of His Majesty's Government inimical to their interests and prejudicial to the Trade.*[104]

Finally, there were also conflicting opinions regarding the best route of communication between the two provinces. The commercial interest preferred to use the more exposed St. Lawrence route to the secure but roundabout Ottawa-Rideau waterway constructed by the military for purposes of defence. Lower Canada constructed the Lachine Canal and Upper Canada the Cornwall Canal in order to improve the navigation along the St. Lawrence in response to the needs of trade and commerce.

Canals and the Early Settlement of the Canadas

I

In any new country occupation of land by the settler is a prime necessity. The Canadian waterways, by making such occupation possible, played a significant role in opening up the country and in creating a viable society in the Canadas. At the conclusion of the American Revolution there were few if any roads west of Kingston. The St. Lawrence and the Great Lakes provided the only highway and a means of cheap transportation to the Loyalists moving into the area and settling in the vicinity of the military posts at Kingston, Niagara and Detroit.

A few years later, following the War of 1812, the Ottawa-Rideau waterway was planned as a military route linking Montreal and Kingston. At the same time it was decided to establish settlements along the proposed route. Disbanded soldiers and Scottish settlers assisted by the British government, of whom 250 settled at Perth in 1816, moved into the range of new townships laid out west of the Rideau River and an industrious and loyal population was soon settled throughout the townships. In 1818, 500 families were established at the village of Richmond; additional Scottish immigrants kept arriving and upwards of 5,000 people were by then settled along the Rideau.[1] Two years later another 2,000 unemployed Scottish weavers and their families, assisted by the British government, settled in the Rideau district. It was hoped that from the retired officers and disbanded soldiers there would eventually be formed a military force capable of protecting this wide area back of the St. Lawrence.[2]

Clearly in this instance settlement was linked with defence. Moreover, there was an additional reason, also relating to defence, for encouraging immigrants to settle along the Rideau. The events of the War of 1812 had clearly shown that the inhabitants of the more distant parts of Upper Canada, especially those in the neighbourhood of Lake Erie, were unable either to participate in the general defence of the province or to defend their property against invading enemy forces. These people suffered heavy property losses from the enemy and, once the war was over, they sought compensation from the provincial government. As a result of this experience, some officials believed that in future it would be wiser to place the immigrants from Britain on lands at the military settlements rather than scatter them throughout the distant parts of the province.[3] Once work was started on the Rideau Canal two companies of the Royal Sappers and Miners, each consisting of 81 men, were raised in England to work on the project. These companies arrived on the Rideau during the summer of 1827 and, following the completion of their work, were discharged in June 1831. Many of these men decided to settle along the canal route. "They and their descendants provided a thin chain of British settlers through the still untouched bush between Bytown and Kingston."[4]

II

After 1822 there was a revival in Great Britain of interest in colonial affairs and the subject of emigration received much attention. Plans were presented to the British government for the joint purpose of relieving distress in Britain and furnishing settlers for the colonies overseas by a state-fostered and -directed system of emigration. A special committee of the British House of Commons investigated the subject in 1826. The side of the question which held the most attraction for the propertied classes in Britain was that of getting rid of surplus population. The question whether indigent immigrants from the British Isles would make successful and resourceful settlers in Canada received little consideration. Numerous experiments in emigration were made between 1826 and 1832 resulting in a great migration of people overseas as indicated by the numbers of immigrants arriving at Quebec each year, as follows:[5]

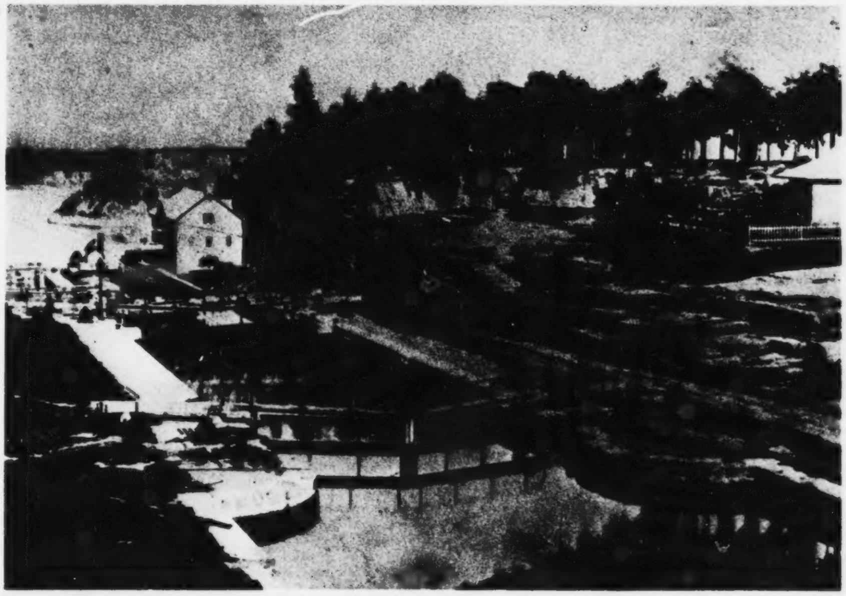
1827	12,648	1830	28,000
1828	12,084	1831	50,254
1829	15,945	1832	51,746

III

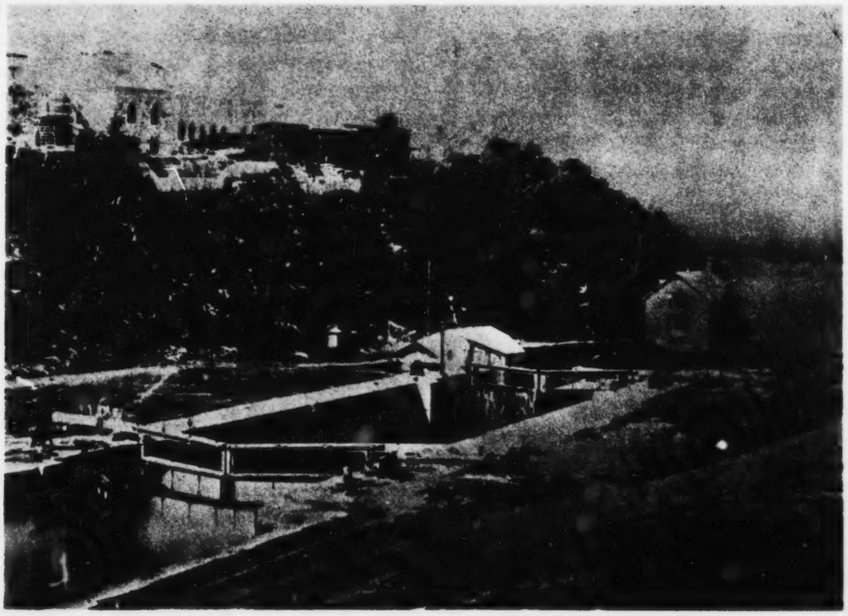
In 1823 the Upper Canada assembly, recognizing the necessity for increased immigration if the province were to develop and prosper, entered into a prolonged debate on the subject. In a series of resolutions passed on 8 March to be forwarded to the Secretary of State for the Colonies, the assembly expressed its opinions regarding the factors which possibly hindered immigration and at the same time made suggestions as to how it might be encouraged.[6] The assembly believed that in the past immigration had been retarded and diverted from the province, first by the great increase in fees for grants of land, and second by the system of location of immigrants whereby numbers of poor people were settled on portions of land distant from each other and remote from mills and roads so necessary for the comfort of settlers. The assembly believed that if the land of Upper Canada were to form a safe investment for capital it must be concentrated in order to be useful and not split up into nonproductive units of clergy and crown reserves. The assembly held that a tract of 200 acres of land was really a moderate quantity for an industrious man with a family. Anything less was scarcely worth his occupation. On 29 December 1823, the assembly passed a further resolution to the effect "That immigration into the Province has been during the last two years, greatly retarded, and great numbers of British subjects arriving in Lower Canada have been passed into the United States of America."[7] A few years later the development of necessary waterways and construction of roads spurred on immigration by opening up vast tracts of wilderness. A considerable number of immigrants came to the Canadas with the intention of buying land and becoming farmers and the majority of these settled in Upper Canada. Just how much capital such immigrants brought into the province is difficult to estimate However, "official immigration reports gives figures of £250,000 and £600,000 as estimates of funds brought in by immigrants arriving at Quebec in 1831 and 1832 respectively."[8]

IV

Government works, especially large ones like the Rideau Canal financed entirely by the British government, afforded immediate employment for the indigent immigrants. The Duke of Richmond wrote to Bathurst in May, 1819, that Captain Mann was proceeding with the projected improvements on the Ottawa as far as the limited means of his own detachment would allow and that he (Richmond) intended from time to time to send Mann a certain number of labourers selected from the immigrants who would probably arrive during the summer and who would require immediate employment.[9] Richmond believed that employment might be the means of preventing many immigrants from passing into the United States.[10] Three years later (1822) in a letter to Bathurst, the



15 Locks at the Ottawa River end of the Rideau Canal, photographed about 1861. (*Public Archives of Canada.*)



16 Taken about 1862, this photograph of the lower end of the Rideau Canal shows the beginnings of construction of the Parliament Buildings. (*Public Archives of Canada.*)

Earl of Dalhousie urged the completion of the Grenville Canal on the Ottawa, adding that the work at present afforded employment to many hundreds of starving immigrants, thereby enabling them to settle along the Ottawa near the canal which would in turn greatly advance the settlement of the country between the Ottawa and Kingston, at that time an immense wilderness and forest.[11] The following year, 1823, Dalhousie wrote again to Bathurst that 10,000 persons were arriving annually at Quebec, three-fourths of whom were literally paupers. The governor stated that society and country were becoming alarmed and that he had to grant immediate relief and try if possible to get employment for them, possibly on the canals.[12] During the construction of the Rideau the contractors needed an immense labour force to do the vast amount of handwork required. A thousand labourers were advertised for at one time.[13] In 1829 the canal gave work to 2,700 men, the large percentage being Irish immigrants who for one reason or another were not prepared to go immediately upon the land.[14] Still later, two shiploads of Irish immigrants were brought out by Peter Robinson. These people worked on the Rideau Canal and settled along the banks of the river. As one early traveller in the Canadas reported,

The Rideau Canal has annually employed two thousand labourers since 1826, and has been of incalculable benefit to the pauper immigrants; for they seldom remained at the works above a year; but in that time they gained a knowledge of the country, and the kind of work they would have to perform in clearing land for their own farms. Some of the Irish labourers are very troublesome characters; they even threatened on several occasions to *shoot the officers superintending and directing the works. "I'll fix my flint for you in the fall! I'll knock the navigation out of ye!" were expressions sometimes employed when they were threatened with punishment or dismissal.*[15]

Not only did the Rideau Canal afford employment to the pauper immigrants, it also presented the settler in the adjacent military townships with a ready market for surplus produce, employment, and at no cost to him, with much needed roads constructed to assist in the building of the canal.

During this period, lack of roads throughout the province meant that internal navigation afforded the principal means of transportation and opening up of the interior. Hence the Welland Canal became an important factor in the growth of Upper Canada. Like the Rideau it stimulated, economically and socially, the area adjacent to it. Small communities stretching along its banks prospered as the canal made waterpower available for mills of all kinds. Industry set up along the canal route as well as on the rivers accessible to the canal. One colonization scheme, hoping to make a settlement on the banks of the Rideau Canal, urged that its plan would, by increasing the population, greatly enlarge the business of the canal.[16]

Besides affording employment to the indigent immigrant, canal construction created a demand for the importation of skilled labour from Britain. Starting with the Cornish miners who were brought from England to do the rock-cutting on the small military canals constructed on the St. Lawrence by the Royal Engineers in the period 1779-83, this trend continued with the construction of the military canals on the Ottawa along with the Lachine, Rideau, Welland and Cornwall canals. Engineers and stonemasons, along with accounting clerks, were among those brought out. Phillpotts reported in 1840 that the necessary enlargement of the Welland Canal to accommodate large steamers could be completed in three years after it had been properly commenced, "provided an adequate number of workmen can be procured for the purpose of carrying it on properly; which can only be done by encouraging emigration on a large scale."[17]

So long as public works like canals, roads and buildings were under construction, there was employment for the immigrant and an inducement for him to remain in the province. In 1832 over 50,000 persons disembarked on the St. Lawrence, yet at that time the demand for labourers exceeded the supply.[18] Three years later it was estimated that at least 20,000 men would be required for public works. These works, however, were mainly connected with transportation and military establishments and themselves gave little permanent employment once they were completed.[19] In 1840 the government of Upper Canada decided upon the further expenditure of public money toward the completion of various public works likely to be immediately advantageous both with a view to accommodating the public and to the employment of immigrants then arriving and still expected to arrive.[20] Two years later a select committee of the British House of Commons investigating unemployment and poverty suggested government aid for emigration along with the development of public works for Canada which would enable the colony to take in 50,000 persons annually.[21] In the same year, however, immigrants and casual labourers were hard hit when work on the Lachine and Grenville canals was quickly finished while that on the Welland Canal and some of the roads did not develop.[22]

For those seeking work there was available, besides employment on public projects and hiring themselves out as labourers in the lumber industry, employment offered by the older settlers. The prevailing system of settlement in the Canadas, particularly Upper Canada, was that of finding the settlers employment with pioneer farmers for the first season at least. This enabled the immigrant to learn how to clear land, cultivate it and erect a cheap habitation. He would then start upon what was termed a bush farm.[23] Throughout this period, however, one of the principal and persistent difficulties connected with the emigration problem in Canada was the lack of capital on the part either of the agricultural class or of those who might have developed the industry of the country. The consequence was that regular employment was altogether inadequate when compared with the numbers seeking it – people who for one reason or another could not themselves go directly upon the land.[24]

V

The public works undertaken in the Canadas prior to union were highly necessary for the development of the country and it would have been a mistake to construct them on a more limited scale. At the same time, the general development of the provinces of Upper and Lower Canada did not keep pace with their transportation facilities. It was difficult to build up the country with an impecunious body of settlers who, though physically capable, could hardly be expected to make encouraging progress when simply left face to face with the wilderness and possessing little else than their physical strength.

Financing the Construction of Early Canals in the Canadas, 1779-1841

I

The imperial government, the provincial government and the private company, either separately or in combination, financed canal construction in the provinces of Upper and Lower Canada prior to 1841. The imperial government initiated this construction. The four short military canals with locks designed to overcome the rapids at the Cascades and Cedars were begun in 1779 by Captain Twiss of the Royal Engineers acting on orders from Governor Haldimand, and were completed in 1783. Construction costs were defrayed out of the military chest. The governor, however, knowing that these canals, though small, would prove of great advantage to the merchants using them, considered it unjust that the whole expense of construction operation and maintenance should fall on the imperial government. A toll of 10 shillings, therefore, was imposed on each *batteau* passing through the locks. It was hoped that the toll collected would partly offset the costs of maintenance. Twiss reported that £132.5.0 in tolls was collected in 1781 and £175.15.0 in 1783 and he believed that the government could expect to receive something like £350 annually.[1] However the canals were only a partial success. The two lower ones were damaged by ice each spring and within a decade all of them fell into disrepair. In 1800, Colonel Gother Mann of the Royal Engineers was authorized to make a report on these canals.[2] He recommended repair, enlargement, and the construction of a new canal at Mill Rapid and the Cascades, and his estimate of costs was about £4,127. In 1804 the locks at Split Rock and Coteau du Lac were partly rebuilt and a new canal about one-half mile in length with 3 locks, 6 feet in width between the gates was constructed at the foot of the Cascades. During the renovation and construction Captain R. H. Bruyère of the Royal Engineers submitted detailed accounts of the work being done to the military secretary for the information of the commander of the forces since the expenditure for the work was met out of the military chest which was under his control.[3] In 1817 the locks on these canals were enlarged by the Royal Engineers from 6 to 12 feet in breadth and the depth of water on the sills increased from 2 feet to 3½ feet for the passage of boats capable of carrying from 80 to 100 barrels of flour.[4] These small military canals were placed under the supervision of the Commissariat Department since the principal use of them was, prior to the formation of the Rideau Canal, for the passage of *batteaux* belonging to that department.[5] At the same time all repairs and other works for maintaining them were performed by the engineer department upon estimates submitted to the commander of the forces by whom the funds were granted.[6]

II

Even before the termination of the War of 1812, the government of Lower Canada had decided to construct a canal between Montreal and Lachine. In January 1815 the Lower Canada House of Assembly received from the governor a message stating that

> *His Majesty's Government having in contemplation the speedy opening of a canal from the neighbourhood of the Town of Montreal to Lachine, His Excellency the Governor-in-Chief recommends the subject to the early consideration of the House of Assembly and that they will grant such supply and other legislative provision as they may deem expedient to assist in carrying into execution so important an object and whereas the execution of such a project will greatly benefit His Majesty's service, ameliorate the Internal Communications of this Province and thereby tend generally to the encouragement of the agriculture and commerce thereof.*[7]

The legislature of Lower Canada responded to this appeal with "An Act to grant an Aid to His Majesty to assist in opening a Canal from the neighbourhood of Montreal to Lachine and further to provide for facilitating the execution of the same."[8] The sum of £25,000 was appropriated for the purpose and three commissioners were appointed and entrusted with execution of the work.[9]

Captain Samuel Romilly of the Royal Engineers now studied the project, made a survey, estimated costs and submitted his report in 1817.[10] He found that the navigation of the St. Lawrence from Montreal to Lachine, a distance of about 10 miles, was very difficult owing to the rapid current and the shallowness of particular parts. He estimated the cost of a canal with a depth of 3 feet of water and capable of passing Durham boats 60 feet long, 13 feet 6 inches wide and drawing 2 feet 6 inches of water, at slightly over £46,000. This was almost twice the figure of £25,000 appropriated for the project which was temporarily shelved.

Meantime the imperial government had focused its attention on the construction of the Ottawa-Rideau waterway. Nevertheless, that government was prepared to give financial assistance should the province of Lower Canada shoulder the burden of constructing the Lachine Canal. In June 1818 the Lords Commissioners of His Majesty's Treasury informed Earl Bathurst, the colonial secretary, that, after considering Sir John Sherbrooke's despatch relating to making a canal from Lachine to Montreal, if the legislative authorities in Canada would make provision for one-half of the expense attending the construction of the canal, they would not object to sanctioning the payment of the remainder out of the army extraordinaries.[11] The province, however, was not prepared to assume the burden of construction.

On 18 January 1819, the government of Lower Canada received a petition signed by a number of leading men of the province including several Montreal merchants, asking that they be incorporated for the purpose of building the canal.[12] A company known as "The Company of the Proprietors of the Lachine Canal" was created with a capital of £150,000 divided into shares of £50 each.[13] The company undertook to build a canal not less than 40 feet wide at the surface of the water, 22 feet at the bottom, with locks 110 feet long by 22 feet wide. Tolls were fixed at 12s.6d. for small vessels under 5 tons burden and up to 30s. for vessels of over 60 tons burden. Each ton of merchandise carried paid an additional 5s. The Crown enjoyed the right to seize the canal at any time either before or after its completion. One of the conditions of the company's charter was that the work should be completed within three years. The company hired Thomas Burnett, an engineer from England, to make a survey and estimate the cost of the work. All in all it expended £2,038 in preliminary work. But the company soon ran into financial difficulties notwithstanding the fact that the British government, recognizing the value of the canal, subscribed for 600 shares while the government of the province subscribed for 200. By 1821 only 1,780 of the original 3,000 shares of capital stock had been subscribed – only £89,000 out of a capital of £150,000.[14] Therefore, in January of that year, the company presented a petition to the legislature outlining the financial difficulties and appealing for certain changes in the act of incorporation.[15] The company found that a great impediment to subscriptions was

> *The exclusion by the thirty-first section of the Act, of the revenues and expenses of repairs and keeping up the Canal and Branch, which may be very heavy, from being considered a part of the capital stock laid out and expended for making the same and thereby from participating in the maximum of interest and profit to be allowed to the proprietors as an inducement or bonus for risk they incur in an untried and costly undertaking.*[16]

The company also stated that it would be an additional stimulus to subscriptions if tolls were permitted to be levied before the whole canal was completed.[17] Moreover, the company wanted an extension of the three-year limit set for the completion of the work. It also asked the provincial government to assume an additional number of shares.[18] The legislature's reply to the petition for aid was to repeal the Act of Incorporation.[19]

At the same time the government of Lower Canada undertoook to construct the canal. The private shareholders of the former "Company of the Proprietors of the Lachine Canal" were compensated for the money which they had expended in development work while the legislature of Lower Canada appropriated £35,000 to the construction of the canal and granted free passage to all boats of His Majesty's service on condition of an aid of £10,000 from the imperial government.[20] This aid was advanced by the governor and commander-in-chief, Lord Dalhousie, from the military chest.[21] At the same time Dalhousie rightly believed that the legislature, now fully committed to the project, would grant further aid, if required, towards the completion of the canal. He therefore informed the imperial government that it should decline any further co-operation in the provincial government's projects.[22]

Meantime commissioners were appointed with John Richardson as chairman to superintend the completion of the work. They advertised for tenders and nominated arbitrators to determine the valuation of the lands through which the canal would run.[23] At the same time they worked out what they considered to be a practical plan for checking and controlling expenditure, specifically the advance of money to contractors within the limits of the agreement. The first check was the measurement by the engineer, from time to time, of the work done, when he certified what the contractor was entitled to receive. This measurement could not be an accurate, precise one so long as the entire work remained unfinished, so in his measurement the engineer kept on the safe side. The second check was an account kept by the assistant superintendent and overseer of the number of men employed each day by the contractor; these were averaged at the end of each week and inspected by the engineer. A third check, or rather security in case of accidental inaccuracy in the estimate of work done, was the guarantees for the contractors who were responsible for the result.[24]

As work progressed the commissioners had from time to time to approach the assembly, amid charges of extravagance, and extract more grants from it.[25] In order that the work proceed steadily despite temporary shortages in funds, the commissioners occasionally obtained short term loans, on their own securities, from the Bank of Montreal.[26] The final cost of £109,601 greatly exceeded the original estimate. A precedent for imperial aid to provincial canals was established when the British government decided to contribute £12,000[27] or about one-ninth of the final cost. The remainder, roughly £97,000, was met by the government of Lower Canada.

III

In 1818, Captain J. F. Mann of the Royal Engineers surveyed the Ottawa River and found the navigation impeded by rapids at Carillon and Grenville. He therefore recommended the construction of three canals with locks between Carillon and Grenville in order to overcome a fall in the river of nearly 60 feet.[28] The three canals – Carillon the lowest, Grenville the highest and Chute-à-Blondeau the intermediate one – were designed by the imperial authorities in 1819 on the scale of the Lachine Canal.[29] The army now undertook the canalization of the Ottawa River and construction was commenced the same year, under the direction of the Royal Engineers, at Grenville, midway between Montreal and the Rideau River.[30] Lord Dalhousie strongly urged the construction of this canal at an estimated cost of £25,000 which was shortly to be increased by an additional £25,000 to be contributed at the rate of £8,000 per annum for three years.[31] At first the annual imperial parliamentary grant for work on the Ottawa River was £10,000, but in 1827 this sum was increased to £15,000 annually in order to hasten the completion of the work.[32] Known as the "ordnance canals," they were completed in 1833.

IV

On 10 March 1826, the Board of Ordnance requested General Gother Mann, Inspector General of Fortifications, to select a competent officer to be sent out to Canada to take charge of the construction of the Rideau Canal.[33] He selected Lieutenant Colonel John By of the Royal Engineers. The Board of Ordnance stipulated that the officer selected was to converse with Sir James Carmichael Smyth who was experienced in the particular duties to be performed and knowledgeable on the subject of the Rideau waterway.[34] Sir James was to draft the proper instructions for the officer selected.[35] Because of the peculiar nature of the duties which the officer would be called upon to perform, the Board of Ordnance directed that the officer should be independent in carrying on the duty entrusted to him. He would only make such general reports to the commanding Royal Engineer in Canada as the custom of military service required and as desired by the governor-in-chief, Lord Dalhousie, and the lieutenant governor of Upper Canada.[36]

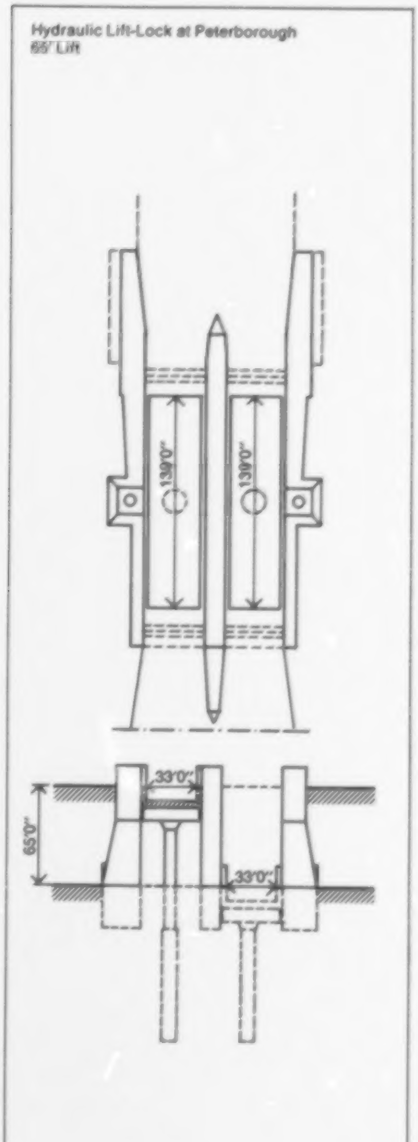
In his instructions to By,[37] Sir James stated that in his opinion it would be found more economical and more expeditious to build the whole of the proposed canal by contract. The Americans had built the entire Erie Canal that way. Should this be done the government would avoid the formation of an expensive establishment which would otherwise be required. Smyth then went on to say that if done by contract the termination of the work at a fixed period could be more easily forecast. Also, if done by contract, only three or four engineer officers and the same number of intelligent clerks of work would be required.

The ordnance department had inserted in the colonial estimate for the previous year, 1825, an item of £5,000 for preliminary work on the Rideau River.[38] This small item had passed the House of Commons without attention being called to it and the ordnance department assumed that, the item having been approved, Parliament was committed to the Rideau Canal project which could proceed without waiting each year for the annual building grant. This really meant that Parliament had received no estimate of the work and had no opportunity of either approving or disapproving of the government entering into such a large undertaking. On 18 April 1826, Earl Bathurst, Secretary of State for War and the Colonies, assured the Board of Ordnance that the work should go on without waiting for the annual grant.[39]

As to the method of drawing the money required for construction, Smyth suggested that the accounts should be carried on as a supplementary Ordnance Act. The necessary sums would be drawn from the military chest by the ordnance storekeepers. The ordnance department would then render each year to the colonial department an account of the sums expended and drawn out of the military chest with an estimate of the sum required for the succeeding year.[40]

The spring of 1827 found By busy in Montreal making arrangements with the contractors.[41] Each contract was an agreement "between the commissary general of His Majesty's forces (in Canada) for and on behalf of the King."[42] In it "the named contractor guaranteed to carry out the stipulated work for the unit sums noted in the document."[43] In one contract the unit prices were 4s. per cubic yard of rock excavation and 1s. per cubic yard for earth excavation. The contractor was

17 Plan of hydraulic lift lock at Peterborough, Trent Canal. (*Sessional Paper No. 20, 1910.*)



paid these prices for each of the units noted. Engineers would measure the total amount of work completed and the quantity multiplied by the unit price would give the toal sum due to the contractor.

By toured the whole route of the canal for the first time in May 1827.[44] In the next two months John Mactaggart, the chief of works, made his initial survey of the route and submitted his report to By in August. In it Mactaggart estimated the total cost of the work to be £486,000.[45] In the same summer Lieutenant Pooley, a young engineer, also took a survey party over the proposed route with instructions to prepare accurate general plans and estimates. Following Pooley's work, By arrived at a revised estimate of £474,000.[46] This estimate, it should be pointed out, was for a canal with small locks measuring only 110 feet by 22 feet. It was not for the larger size locks strongly recommended by Colonel By. Lord Dalhousie suggested that the new plans and revised estimates be sent immediately to London to ensure their arrival in time to lay before Parliament.[47] Pooley was chosen for the task and left for England in November. By's report to the Board of Ordnance strongly recommended that the size of the locks be increased to 150 feet long by 50 feet wide with 5 feet in depth.[48]

By's report with its increased estimate of £474,000 greatly alarmed the ordnance department in London. On 2 January 1828, the Rt. Hon. William Huskisson wrote to Lord Dalhousie that the estimate was so alarmingly high that it had become necessary to subject the entire proceedings to the strictest examination.[49] A committee of engineers was set up to investigate the various documents, plans and estimates. Orders were issued to By to suspend all such operations as were not absolutely necessary to be performed immediately. Dalhousie was requested to assist By in prevailing upon individuals to suspend contracts into which they may have entered but which were not yet sanctioned by His Majesty's government.[50]

In its report of 22 January 1828,[51] the committee of engineers declared that it could find nothing wrong with By's plans and estimates. The committee members were impressed by the daring plans to flood out some of the rapids and falls with high dams. The report, however, still did not entirely satisfy the British government. Whereupon, the Board of Ordnance appointed a special commission of military engineers to make a further, and what was intended to be a final, report on the subject.[52] The commission was under the chairmanship of Lieutenant General Sir James Kempt, then lieutenant governor of Nova Scotia, with Colonels Fanshawe and Lewis of the Royal Engineers as members. The commission was instructed to examine personally on the spot the plans and estimates of Colonel By. If they found the project was practicable and that it had been designed and was being conducted economically, then they were to authorize By to continue with the work. Otherwise he was to be stopped. The commission was also "authorized to approve the larger size of locks which By recommended if they agreed with him on this point."[53]

Throughout the winter and spring, while the committee was actually scrutinizing his plans and estimates, By had been carrying out more accurate surveys and preparing further plans for the Rideau project. As a result of this additional work he was able to submit to the committee, when requested to do so, an estimated cost of the different sized locks for the Rideau Canal:[54] for the Lachine lock of 108 feet long by 22 feet wide, £544,676.2.9½; for the lock of 150 feet long by 50 feet wide with the sluices in the gates as By proposed, £697,672.2.9½; for the lock of 134 feet long by 33 feet wide approved by the committee, £576,757.14.9½.

This latter figure was reduced to £558,000 by the committee which considered it a reasonable estimate and one which would meet every probable contingency. The committee's decision regarding the approved size of locks appears to have been a compromise between the two extreme proposals of Sir James Carmichael Smyth for locks of 108 feet by 20 feet and Colonel By for locks of 150 feet by 50 feet.[55]

On 28 June 1828, the committee issued instructions to By authorizing him to proceed with the work as he had planned and to build the locks with the new dimensions of 134 feet long by 33 feet wide with the same depth of 5 feet.[56] A few days later, on 3 July, Sir James Kempt wrote to Lord Dalhousie that the committee had gone over the whole line of the intended navigation and inspected the work in progress.[57] Sir James then went on to say that the committee had instructed Colonel By to proceed with the work though they were unhappy about the amount of the estimate.[58] Yet they had no alternative but to accept it since, according to Sir James, "they could hardly refuse their sanction to any further advance of the work and thereby involve His Majesty's government in a certain loss for the detention and breach of contract and at the same time sacrifice a large portion of the expense already incurred for specific contracts."[59] They therefore authorized By to proceed upon what the committee members considered the most practicable means of adopting the navigation for all probable naval and military purposes and for the commercial uses of the upper country. The size of the new locks would allow the passage of steamboats 30 feet wide over the paddle wheels and for spars 108 feet long clear of opening the gates. And finally Sir James Kempt mentioned that the committee also specified the sum to which By's expenditure was to be confined in the year 1828.

In January 1831, Colonel By laid before Colonel Durnford, commanding Royal Engineer in Canada, a detailed report of expenditures consisting of 311 pages on more than 500 items.[60] By showed in each case the amount of the item in the estimate of £576,757 given the Kempt Commission, the amount expended at the date of the report and the amount required to complete; and when the item required an increase of expenditure beyond the amount totalled in the estimate of £576,757 an explanation was given. In closing By wrote:

I beg in conclusion to remark, that the original Plan and Estimate were formed from as correct data as could be obtained during the period that the woods and swamps were uncleared, and in consequence of their impenetrable nature; many of the surveys required has to be taken during the severity of a Canadian winter, and when these circumstances are taken into consideration with the additional fact that from the country being so extremely unhealthy, nearly all my Officers, Clerks of Work and Overseers, have suffered from repeated and severe attacks of sickness, caught whilst in the performance of their respective duties, it will not, I think, appear so much a matter of surprise that the Plans and Sections have in some instances proved to be incorrect as that so few errors have taken place.[61]

In this same year a select committee of the British House of Commons was appointed to review the accounts and papers of the Rideau Canal. After hearing witnesses who were familiar with the canal works and searching through papers, correspondence and accounts relating to it, the committee published a report dated 30 May 1832.[62] This document was mainly concerned with the manner in which the Rideau Canal project had been handled by the London authorities. It contained no criticism of the superintending engineer.

In February 1832, By submitted to the Board of Ordnance in London his final estimate for the construction of the canal. The total now was £715,408.[63] The sum was £22,700 above what had been voted by the imperial Parliament for that year. In addition By calculated that "to complete the entire project with all its ancillary defences" would require £60,615 for a total estimate of £776,023;[64] a sum exceeding by £216,023 the estimate of £558,000 accepted and approved by the Kempt Commission in 1828. The cost of extras found to be necessary as construction progressed, such as the adoption of waste weirs, the enlargement of dams and embankments following the collapse of the first dam at Hog's Back, accounted for the substantial increase in cost apart from about £30,000. When one considers the wretched conditions under which the Rideau Canal was constructed, the discrepancy between approved estimate and final cost does not seem excessive. The Lords of His Majesty's Treasury in London, however, took a different view. On 19 May 1832 the secretary of the Board of Ordnance forwarded By's estimate to the Treasury. Six days later a Treasury Minute was issued, part of which stated:

> *My Lords have under their serious considerations the letter from the Secretary of the Ordnance. . . . My Lords will take in their future consideration these voluminous Accounts and Papers; but they cannot delay expressing their opinion to the Master General and Board of Ordnance on the conduct of Colonel By in carrying on this Work. . . . In order, therefore, to complete the Work, Colonel By has, upon his own responsibility, thought proper to expend no less than £82,516. . . . It is impossible for My Lords to permit such conduct to be pursued by any public functionary. If My Lords were to allow any person whatsoever to expand with impunity . . . a larger amount than that sanctioned by Parliament and by the Board, there would be an end to all control and My Lords would feel themselves deeply responsible to Parliament. They desire, therefore, that the Master General and Board will take immediate steps for removing Colonel By from any superintendence over any part of the Works for making Canal Communication in Canada, and for placing some competent person in charge of those works, upon whose knowledge and discretion due reliance can be placed. . . . My Lords further desire that Colonel By may be forthwith ordered to return to this country that he may be called upon to afford such explanation as My Lords may consider necessary upon this important subject. Let copies of these Papers, and this Minute be forthwith prepared with a view to their being laid before the House of Commons.*[65]

This indictment was submitted officially to the House of Commons. Colonel By was recalled. The House of Commons then appointed another committee which heard evidence including that of Colonel By. He was exonerated. He did not, however, receive "the honours which should have come to the builder of the Rideau Canal."[66]

According to memoranda from ordnance documents the total cost of the Rideau Canal to the imperial government was £803,774.56 or $3,991,701.47 – a total which comprised the following items:[67]

	Sterling			Currency
	£	s.	d.	
Land	44,807	12	6¼	$ 218,063.79
Work done by contract	625,545	6	5	3,044,320.56
Lock gates	23,141	6	10¾	112,621.50
Pay of establishment	110,279	19	8	536,695.92
	£803,744	**5**	**6**	**$3,911,701.77**

V

The Welland Canal Company received its original charter in 1824.[68] That charter authorized the company to issue 3,200 shares of common stock at a par value of £12.10.0 each making a total capitalization of £40,000. The amount was quickly subscribed by residents in New York state who took over half the amount, and by residents in Upper and Lower Canada who took the remainder. No attempt was made to sell any of the stock to British investors.[69]

Early in the following year the Upper Canada House of Assembly passed a resolution to lend the company £25,000 and to permit an increase in capitalization.[70] On 13 April, the company received an amended Act of Incorporation but no accompanying financial assistance.[71] The new charter increased the authorized capital to £200,000. It also allowed persons who had subscribed under the old charter to withdraw and be paid their subscriptions should they so desire. Forty persons representing a total of 170 shares took advantage of this right. New subscriptions, however, a total of 232 being sold in Upper Canada alone, offset the withdrawals.[72] Yet only eight individuals invested the £250 necessary to qualify them for a seat on the board of directors. These eight were John Henry Dunn, John Beverly Robinson, William Allan, Henry John Boulton, D'Arcy Boulton, Colonel Joseph Wells, George Keefer and William Hamilton Merritt.[73] Most of these men were persons of high social rank and politically influential. Dunn, Allan and Wells were members of the legislative council. Allan was also president of the government-sponsored Bank of Upper Canada. Robinson was attorney general. He and H. J. Boulton, the solicitor general, were leading members of the assembly. D'Arcy Boulton, father of H. J. Boulton, was a judge of assizes.

In 1825 the board of directors petitioned the lieutenant governor of Upper Canada for a grant of land. Maitland forwarded the petition to Bathurst on 19 May, at the same time strongly recommending that it be granted.[74] Bathurst accepted the recommendation[75] and the following year Maitland made to the company a grant of 13,000 acres of land in the township of Wainfleet. The same board meeting which decided to petition for a grant of land also decided to reserve one-half of the total capital stock of 8,000 shares for sale in Great

Britain to be disposed of there through the agency of the Canada Company.[76] Of the remaining 8,000 shares, 4,000 were to be sold in the Canadas and 4,000 in New York. The board limited the amount of the New York subscriptions because it was "anxious to preserve the management of the Company under British influence." The Canada Company was expected to find influential subscribers for the £100,000 of company stock reserved for Great Britain. At the same time an agent was sent to London with documents to explain the project in detail.

During May and June, 1825, Dunn went to New York where he not only sold all the quota of stock reserved for that market but an additional amount of £25,000. At the same time, he was able to sell £25,000 of stock in the Canadas.[77] This left only the £100,000 of stock reserved for the British market to be sold.[78] However, just at the time that this was offered to the British public, panic struck the London capital market in December, 1825, and few shares were sold. This meant that the company was deprived of half of its capital and therefore crippled before its operations were fully begun.

Late in 1825 Dunn informed a select committee of the assembly that the company required assistance until the British subscriptions became available.[79] Thereupon the committee recommended that a loan be granted and this was done on 30 January 1826.[80] The company received £25,000 repayable in three equal instalments in two, four and six years with interest at 6 per cent payable semi-annually. With this assistance the company continued operations during 1826. In September of that year the Canada Company in London formed a committee to act on behalf of the Welland Canal Company in the London money market but this action brought no immediate relief.[81] By the end of the year the stock sold at 50 per cent discount in New York and it was clear that the company was in serious financial difficulties.[82]

Meanwhile on 30 September 1826, Bathurst, the Colonial Secretary, had stated that the British government was prepared to grant to the company "a sum equal to one-ninth the estimated cost of construction on condition that government stores and vessels were permitted to use the canal without paying toll."[83] As noted before, imperial aid in the form of a grant of £12,000 or one-ninth of the estimated cost had been given in the case of the Lachine Canal on conditions similar to those now laid down for the Welland. The Smyth Commission, which as we have seen visited Upper Canada in the summer of 1825, had estimated the cost of the Welland Canal at £147,240.[84] Taking this figure as correct, Bathurst offered the sum of £16,360 sterling to be paid in four annual instalments. However, authority to draw for the first instalment was not immediately forthcoming and as things eventually turned out the company never did receive this grant.

Unsuccessful in disposing of its stock in the London and New York markets during 1826, the company, desperate for capital, turned once again to the provincial legislature. Early in 1827 the company presented petitions for aid, urging the provincial governments to purchase its stock. Both of these applications were successful. In Upper Canada a motion to purchase £50,000 of stock in the Welland Canal Company was carried in the assembly and the whole of this subscription was made immediately available in order that the company might be enabled to press ahead with the work.[85] However, in return for the province purchasing this stock, the company was required to deposit with the receiver general a bond for £20,000 to be forfeited if interest at 6 per cent were not paid semi-annually one year after the completion of the canal to the Grand River.[86] At the same time the assembly of Lower Canada approved a bill granting £25,000 for the purchase of Welland Canal Company stock.[87] By means of these two large subscriptions the company's financial position was healthy during the first few months of 1827.

On 10 March 1827, Dunn wrote to Lieutenant Governor Sir Peregrine Maitland giving an account of the company's financial position.[88] At that time, of £200,000 authorized capital stock, £93,000 had been subscribed by private individuals. Of this sum, however, £10,000 had reverted to the company through nonpayment of instalments. Of the remaining £83,000, 27 per cent was still to be paid in. The company now had available £50,000 subscribed by the government of Upper Canada together with the British government's promise of £16,360. Estimated total cost of the canal was now £230,000. Of this sum £90,000 had already been spent. This left £47,000 still required to bring the work to a successful conclusion. Since, at this time, the imperial government had declared its intention to make money available for public works at low interest rates, Dunn wrote that

It had suggested itself to the Directors that if His Majesty's Government would consider the actual expenditure of £170,000 as sufficient security to render it prudent to afford the accommodation alluded to and would raise by loan in England the funds still wanting say

18 William Hamilton Merritt (1793-1862), politician. Keenly interested in the development of inland waterways. Merritt promoted the Welland Canal and strongly urged the improvement of the St. Lawrence canal system. (*Public Archives of Canada*.)

> *£50,000 sterling, the Directors relieved from the uncertainty of stock being subscribed by individuals, might safely proceed to put the Western Section of the Canal from the Welland to the Grand River at once under contract and the certainty would be afforded of the navigation being completed with the least possible delay; it need scarcely be mentioned that if the remaining £57,000 stock should be subscribed in America it would of course enable the Company immediately to redeem the loan.*[89]

Meanwhile, though work on the canal was progressing favourably, it was clear that only public assistance had enabled the company to survive as long as it had and only by the continuance of public funds could it hope to complete its task. The hard fact was that "out of a capitalization of £200,000 – itself less than adequate – private individuals had subscribed only £83,000."[90] Dunn's letter to Maitland was forwarded to the Colonial Office on 12 March 1827.[91] It was not well received. The Treasury informed the Colonial Office that they could not recommend Parliament "to lend any money for the completion of the canal upon any security which the proprietors of the company could offer."[92] The Treasury went on to say, however, that "if the provincial government were to guarantee payment of interest on the loan and set up a sinking fund for redemption of the principal an imperial loan might be arranged."[93] Nothing was ever done about the suggested provincial guarantee.

By 1828, the company's financial situation was desperate. It was estimated that if no further financial assistance were forthcoming after the end of July, the company would bankrupt. The board now decided to send an agent to England primarily to arrange for the payment of the imperial "one-ninth grant" and with a roving commission to sell shares or arrange a loan wherever opportunity offered. Merritt was to be the agent and he sailed from New York on 16 March 1828. In England he finally got the imperial government to act and on 11 July 1828, an appropriation for a loan of £50,000 sterling to the Welland Canal Company passed the House of Commons.[94] The loan, however, was granted instead of, not in addition to, the "one-ninth grant" promised by Bathurst. As security for the loan "Merritt had mortgaged the canal itself with all its property, tolls and profits to the British government. Interest on the loan was to be paid at 4 per cent per annum and the principal was to be repaid within ten years. If principal and interest were not paid promptly the canal would become government property."[95] In England at this time, Merritt also succeeded in selling all the remaining stock of the company, or 2,467 shares, to private individuals some of them distinguished public figures like the Duke of Wellington and Alexander Baring.[96]

Until this time the company had managed to pay the interest on its debts to the provincial government, but now the situation changed dramatically. In November, 1828, there was a major disaster when the slides in the Deep Cut occurred. After this incident the sum of £54,662 was required to finish the canal for ship navigation. At the same time something like £42,000 was needed to pay off past indebtedness to private individuals.[97]

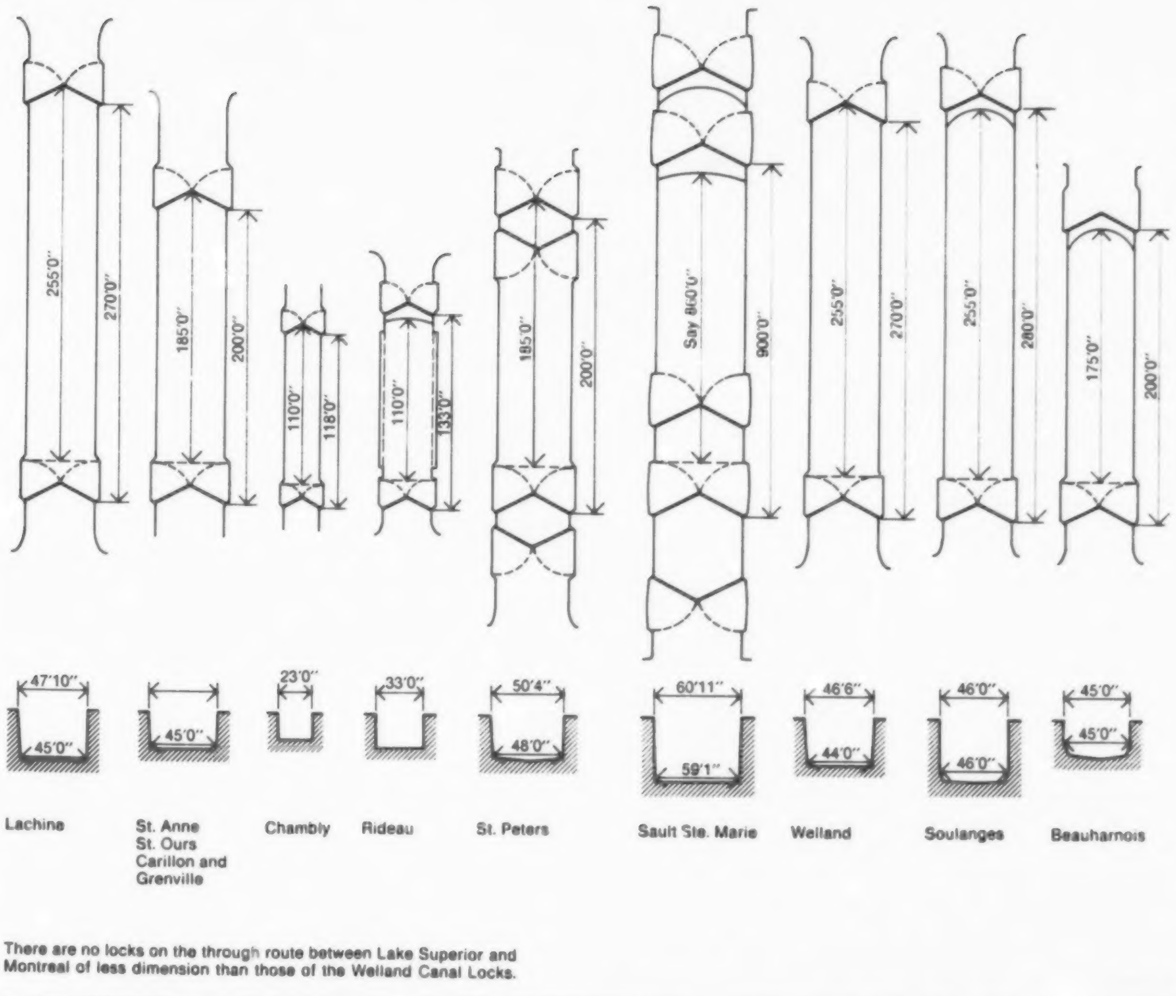
Continued deterioration characterized the company's financial position throughout 1829. English subscriptions receded rapidly. Ellice and Company had pledged itself to purchase £1,500 of stock and the Canada Company had pledged itself to purchase £6,000 of stock. When news of the Deep Cut slides reached London in July 1829, both these companies repudiated their pledges.[98] The company now applied to the Bank of Upper Canada for a loan and a small advance was obtained on the personal security of the directors.[99] "Finally, in desperation, the board had recourse to the extraordinary expedient of applying to the lieutenant-governor, Sir John Colborne, for a personal loan of £10,000," which was granted.[100] By the end of the year when the canal was opened for traffic, the company had a floating debt of £15,467 in the form of arrears to contractors and unsettled claims for damages. Cash on hand amounted only to £152.19.11.[101]

Following the completion of the canal, the directors in 1830 applied once again to the provincial legislature for financial assistance.[102] The company now sought a loan of £25,000 in order to pay its immediate debts and to cover the cost of necessary maintenance and repairs. It also sought to increase the capital stock to £300,000. A majority of the assembly voted in favour of making the loan thus bringing the investment of the provincial government in the canal to £100,000.[103] The capitalization, however, was not enlarged. A similar petition to the legislature of Lower Canada was a failure.[104] At the same time strenuous efforts were made by J. B. Yates, a prominent New York stockholder, to sell stock in the United States but without success. He then went to England where he managed to sell 1,158 shares, having only 459 still to be disposed of.[105]

Once again the company applied for aid to the Upper Canada legislature.[106] A request for an additional loan of £25,000 was referred by the assembly to a select committee which recommended that the government should lend the company not the £25,000 asked for but £200,000, enough to pay the loan made by the British government as well as all previous provincial loans.[107] This recommendation the assembly rejected. Instead, an Act was passed on 16 March 1831,[108] which gave the company a loan of £50,000 on condition that the directors should furnish individual security that this sum would be used to complete the whole canal including harbours and that "the government would be indemnified against the payment of the interest and one-half of the principal." To finance this loan the province issued debentures for a corresponding amount which were issued directly to the canal company to be disposed of as the directors could best arrange. "On May 11, 1831, arrangements for a loan at 5 per cent interest were concluded with the Bank of the United States, the provincial securities to be deposited with the bank as collected on a dollar-for-dollar basis as and when the money was required."[109]

As noted previously the mortgage given to the British government covered the whole canal and its revenues, including the large grant of land in Wainfleet and the water-power privileges. In March, 1831, Yates purchased all the landed property (still burdened by the mortgage to the British government) of the company with the rights to sell or lease the surplus water for the sum of $100,000. The canal company received a bond for £25,000 and an understanding that £1,500 would be paid as interest on that bond every year.[110] Yates, an alien, was unable legally to hold landed property in his own name in Upper Canada so he formed a partnership with his nephew, A. Y. Macdonell, and with Ogden Creighton – a partnership which

19 Plans and sections showing the dimensions of the smallest lock on each of the Canadian canal systems except the Trent Canal. (*Sessional Paper* No. 20, 1910.)



There are no locks on the through route between Lake Superior and Montreal of less dimension than those of the Welland Canal Locks.

came to be known as the Hydraulic Company.[111]

Meanwhile the Welland Canal Company faced the problem of a shortage of cash and short-term credit.

> *The £50,000 grant from the provincial government could be expended under the terms of the act only for the completion of the canal. It was not available for the liquidation of the company's floating debt amounting approximately to £11,000. Most of this debt consisted of sums due the contractors for work performed and unsettled claims for land damages.*[112]

But sources of short-term credit were now drying up. The Bank of Upper Canada would no longer assist the company. Early in 1832 the directors forwarded to the Colonial Office a memorial praying that the imperial government should give up the mortgage in so far as it related to the land and hydraulic privileges.[113] The Colonial Office replied that in this matter Lieutenant Governor Sir John Colborne was to use his own discretion. Treasury insisted, however, that Colborne was not to release the company from the mortgage before first ascertaining that ample security remained for the loan.[114] Colborne decided to do nothing.

Again the company petitioned the legislature for a loan of £25,000 offering as security the bond given by the Hydraulic Company. The legislature, however, refused to sanction the loan, leaving the mortgage in the company's hands and subscribing for £7,500 of stock. Three commissioners appointed by the legislature were to supervise the use of this money in improving the canal. Yet the new government subscription did not relieve the company from the pressure of its debts. The end of 1832 found the company owing £11,814 to contractors and other claims amounting to £8,000. At the same time work indispensable to the opening of navigation was estimated at £6,319.[115]

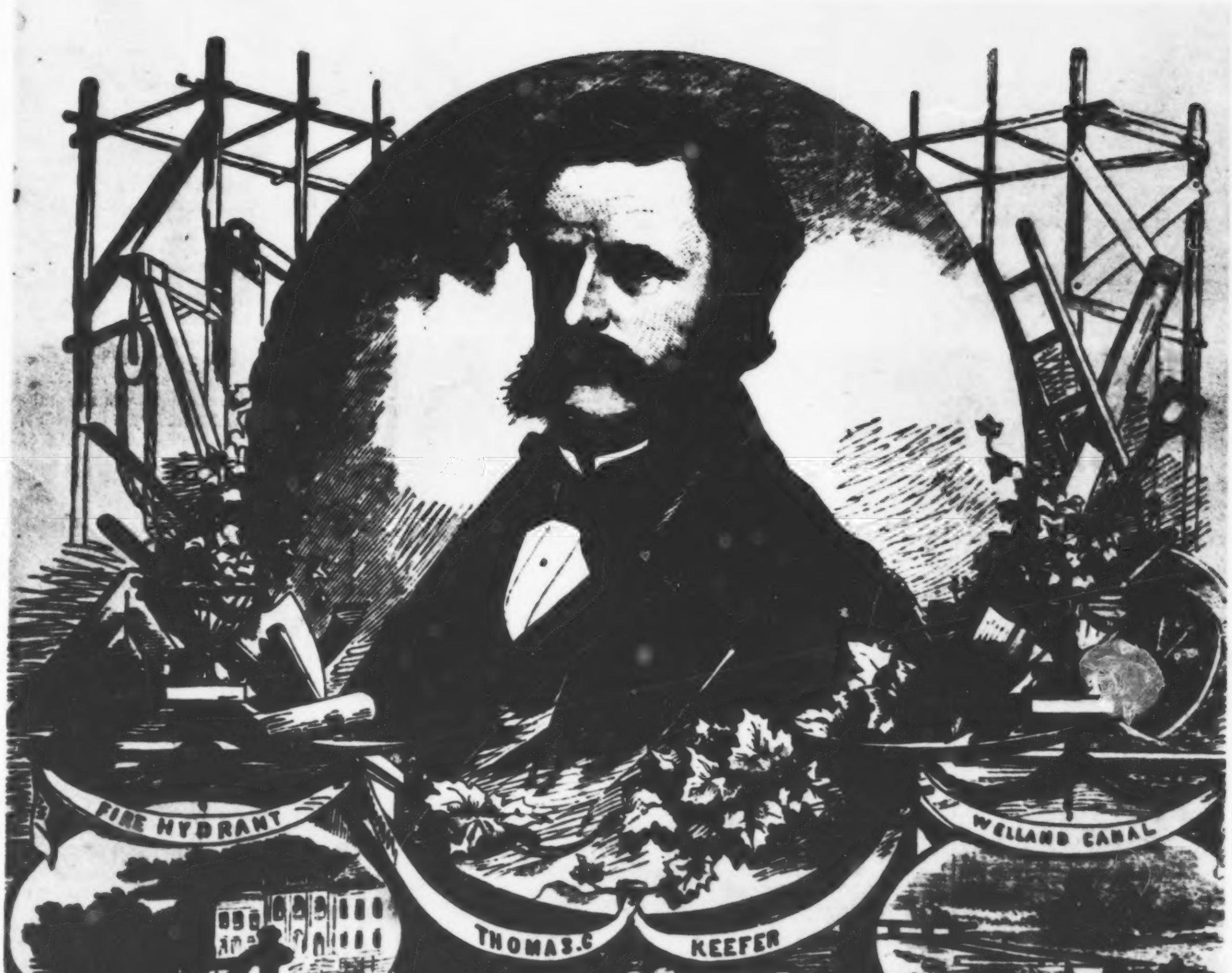
Once again the company attempted to raise money on the security of the Hydraulic Company's bond. The lieutenant governor was beseeched to release the company from the mortgage on the hydraulic property. Colborne consulted his attorney general who advised that the lieutenant governor should refuse to release the company from its mortgage until the full £25,000 offered by the Hydraulic Company was paid. Thereupon the lieutenant governor informed the board that he would consent to the release "only if the whole £25,000 which the company proposed to borrow on the security of the Hydraulic Company's bond were expended on perfecting the feeder and completing the new cutting to Lake Erie." What was most required, however, was security for a loan to pay off the floating debt. Colborne finally granted the release. Yates managed to obtain a loan of £25,000 which was used to complete the new harbour on Lake Erie now named Port Colborne.[116]

In 1833, Benjamin Wright, the principal canal engineer in North America, submitted his report on the Welland Canal. He exonerated the company from charges of waste and mismanagement.[117] The commissioners appointed by the legislature now recommended that the canal should be made a national work. However, provincial purchase was politically impossible until the lands and hydraulic privileges alienated by the canal company were repurchased. Provincial purchase was also difficult because of the attitude of the New York stockholders. They would not surrender their title to the canal without full payment of principal and interest. They would much prefer not to sell if only adequate assistance was obtained from the government. The demand for full principal and interest removed the possibility of government purchase for the time being. Provincial finances would not permit it.

With provincial purchase left in abeyance, the legislature passed, on 6 March 1834, an Act[118] authorizing the purchase of £50,000 of stock, the capitalization of the company being increased to £250,000 to accommodate the subscription. Government representation on the board of directors was increased to three members out of seven. The following month the assembly of Upper Canada drew up an address to the King praying that the imperial loan of £50,000 be relinquished. The address pointed out that the province had now given assistance by subscriptions and loans to a total of £207,500; that three directors were appointed by the legislature; and that the company had a right to expect, by the terms of the dispatch of 1826, a grant of one-ninth the estimated cost of construction. The address then went on to state that

> *From the amount of debt to, and the security held by His Majesty's Government on the said Canal, the Company have been and still are unable to obtain further loans, otherwise than from the Revenues of this Province – that the increased value of Crown Lands, which will be produced by the completion of this work, besides the advantages which the Mother Country will derive from the extension of commerce in consequence thereof will in the opinion of this House more than compensate for this expenditure of the fifty thousand pounds, which will not exceed the one-ninth part of the cost of the said canal.*[119]

20 Thomas Coltrin Keefer (1821-1915), civil enginee. A leading hydraulic engineer and first president of the Canadian Society of Civil Engineers. Keefer was employed on the Erie, Welland, Ottawa and St. Lawrence canals. He was also chief engineer of the Montreal Waterworks. Taken from the *Canadian Illustrated News*, 26 September 1863 (*Public Archives of Canada*.)



21 The old Sappers Bridge over the Rideau Canal, Ottawa, as depicted by H. Cotton, 1867. (*Public Archives of Canada.*)

The appeal was in vain. "The Colonial Secretary refused to reverse the decision of his predecessor." To do so would, he believed, "set a bad precedent for future assistance to important colonial projects."[120]

The canal, however, still needed capital. The company now had only two policies open to it. It could continue to rely on the provincial government for financial aid. This meant increasing government control and final government purchase. Or it could attempt to mobilize sufficient capital to pay off all government loans and subscriptions and carry on under private ownership. Both lines of policy were pursued simultaneously. Merritt and his supporters in the Upper Canada legislature pursued the first policy. In June, 1834, the canal company bought back its real estate and hydraulic rights. The canal company returned to the Hydraulic Company the bond for £25,000 originally given in consideration for the transfer and also gave its own bond for £17,500 payable in 50 years with interest at 6 per cent payable semi-annually. At the same time the Hydraulic Company was permitted to hold about 200 acres of land in Allanburg and Port Colborne.[121]

Yates, acting in direct contact with financial houses in New York and Upper Canada, now pursued the second policy of mobilizing sufficient private capital and paying off all government loans and subscriptions and carrying on under private ownership. By April, Yates was certain that a loan could be raised from private sources. By September he was ready to urge immediate action and finally in November he urged Merritt to come to New York at once. Late in December one of Yates' staunch Upper Canada supporters forwarded to the lieutenant governor a letter from "certain mercantile Houses and Individuals in the City of New York" inquiring whether he felt himself authorized to dispose of the government interest in the canal, and if so on what terms.[122]

But now political events intervened to greatly damage the company. The legislature had appointed William Lyon Mackenzie to the board of the company early in 1835. Mackenzie burrowed through "the company's chaotic account books" and emerged on 21 October with "a series of charges of fraud and defalcation on the part of the company's officers." Merritt, a member of the assembly, succeeded in having the matter referred to a select committee which, after prolonged inquiry, finally emerged with a verdict of "not proven" on several accounts. But the damage was done. Confidence in the canal was badly shaken. Yates argued that if the government were dissatisfied with the management of the canal, let them sell their interest in it and divest themselves of all responsibility. He had an offer ready and the government had only to accept. This, however, was not what Mackenzie and his followers wanted. They were determined to make political capital out of the Welland Canal.

During this period the company, in order to avoid complete bankruptcy, resorted to the desperate expedient of issuing its bills as currency. At the same time Merritt prevailed upon private individuals "to endorse the company's notes." It was clear that if the company's financial situation did not improve it would be impossible to keep the canal open. "On August 6, 1836, the board decided to ask the private stockholders for authority to open negotiations for the sale of their interest in the canal to the provincial government."[123] On 2 November a general meeting gave the necessary permission and a memorial was presented to the lieutenant governor praying that the province would buy out the private shareholders.[124] There also appeared on 29 November the report of a select committee on the Welland Canal which recommended "making the Welland Canal strictly a public work."[125] At this time investments in the canal were probably held as follows:[126]

Shares held by private parties	£117,800
Loan and shares held by Upper Canada govt.	275,644
Shares held by Lower Canada govt.	25,000
Loan by imperial government	55,555
	£473,999

However, the legislators of Upper Canada were in no hurry to purchase the canal. On 14 March 1837, an Act[127] was passed which was intended as a substitute for outright purchase. It dealt with the long overdue organization of the company's finances. The capitalization was increased to £597,300 of which the government of Upper Canada was to hold £454,500; £209,500 to represent a consolidation of previous loans and subscriptions, and a new subscription of £245,000 for the permanent reconstruction of the canal with stone locks. "The remaining lands held by the Hydraulic Company were to be repurchased. The number of directors on the board was reduced to five so that three government appointed directors held a majority."[128] The Act marked the end of private control.

But the Act was inoperative almost from the start. The stockmarket crash of 1837 occurred just before the last and largest provincial subscription could be raised. "Only £68,144 of the promised £245,000 was actually realized. After April 1837 the province could not sell its bonds."[129] In the same year occurred the Canadian rebellions to complete the debacle.

The three government appointed directors now informed the lieutenant governor "that the canal could be kept open for navigation only by incurring an annual net loss of about £14,000."[130] Pessimistic about possible future increases in traffic, they raised the question whether it might be wiser to "let the Canal go to decay" using it as a reservoir for water-power only rather than by continuing to pour money into the work. Such a report represented a direct threat to the interests of the private stockholders. If the canal was to be abandoned, there was little hope that the private stockholders would ever receive any return on their investment. "Their only hope lay in arranging to withdraw their capital entirely by exchanging their shares for the slightly less dubious security of provincial debentures."[131] In March, 1839, the New York shareholders petitioned the provincial government to buy them out.[132]

Two months later the legislature passed a bill[133] providing for the purchase of the private stock in the canal by the provincial government. The shareholders could now exchange their stock if they so desired for 20-year debentures bearing interest which increased over the years from 2 per cent to a maximum of 6 per cent. The Bill also provided that former shareholders would receive debentures for back interest due them once the canal tolls reached £30,000 per annum. But by this time the state of the provincial credit was so precarious that the lieutenant governor, Sir George Arthur, did not want to add to the public debt for the purpose of compensating the private stockholders until the funds required to complete the canal had been raised. He therefore reserved the Bill for the Queen's approval.[134]

However, a committee of the assembly, to which the whole matter had been referred, advised that an address be submitted to the Queen praying that the bill should receive the royal assent.[135] A motion to address the Crown was then carried in the legislature on 25 January 1840.[136] When the first Parliament of the now united provinces met in Kingston on 14 June 1841, the Welland Canal Compensation Bill[137] was one of the first measures introduced. It became law on 5 July.

Yet this Act also proved to be inoperative. The debentures issued were unsaleable at anything like their nominal value. The bonds sold in England only at a heavy discount and both the Treasury and colonial secretary recommended that the Act be amended. A new Act was therefore passed in 1843[138] which provided for the issue of debentures payable in 20 years, bearing interest at 5 per cent if payable in Canada, with debentures for back interest to be issued when the canal tolls reached an annual figure of £45,000. With this acceptable compromise, the Welland Canal Company passed out of existence.

So far as can be ascertained the expenditure on the Welland Canal by the time of union was as follows:[139]

Stock originally held by private parties and assumed by government	$471,200.00
Old stock held by Province of Upper Canada	430,000.00
Loans made by Province of Upper Canada and converted into stock in 1837	408,000.00
New stock, Province of Upper Canada, advanced and spent up to the end of 1837	264,576.00
Stock held by Province of Lower Canada	100,000.00
	$1,673,776.00
Additional expenditure prior to the union	177,651.77
	$1,851,427.77
Sum advanced by imperial government and spent before the union	222,220.00
Total	**$2,073,647.77**

VI

The difficulties experienced by the Welland Canal Company in financing canal construction convinced the people in Upper Canada that in future such construction should be undertaken by government. Waterways, vital to the Canadian economy, made such demands on overseas sources of capital that only governments could undertake such improvements. The Cornwall Canal was a case in point. As early as 1816, proposals to construct a canal on the St. Lawrence designed to avoid the Long Sault Rapids at the head of Lake St. Francis had been presented to the legislature of Upper Canada.[140] Two years later a joint commission appointed by the legislature of both provinces to report on the water communication of the upper St. Lawrence had recommended that an early start be made with the construction of canals on this stretch of the river to be not less than 4 feet deep and to cost $600,000.[141] Nothing was done, however, about this recommendation. Yet the subject was not allowed to lapse. In 1826 the lieutenant governor submitted to the legislature a report by Samuel Clowes outlining two plans, one for a canal with 8 feet depth of water and one for a 4-foot waterway.[142] The town of Brockville now took up the matter. Fearing that the completion of the Ottawa-Rideau waterway would draw traffic away from the St. Lawrence and thereby affect adversely the commercial life of the town, Brockville, in 1830, undertook a preliminary survey for a canal between Cornwall and Dickinson's Landing around the Long Sault Rapids. At the same time the town pressured the legislature to take action in this matter[143] and this the legislature did in 1832 by passing a resolution approving the construction of a canal having 9 feet depth of water.[144] Commissioners were appointed the following year to supervise the work.[145] Two engineers, Benjamin Wright and John B. Mills, were employed to make a report and the plans they submitted for the Cornwall and Williamsburg canals involved an estimated expenditure of £350,000.[146]

Work was begun on the Cornwall Canal in 1834, the only major canal project undertaken by the province of Upper Canada before the union of the provinces. In order to finance the project, the province floated for the first time a series of loans in the London market. It is interesting to note that those persons who pressed most strongly for this canal were also involved in the Welland Canal, for they realized that the full potentialities of the Welland could only be realized upon the complete canalization of the St. Lawrence. Hence we find that W. H. Merritt introduced into the Upper Canada assembly the bill that empowered J. H. Dunn, president of the Welland Canal Company, to raise the loans in London in 1834 and 1835. These loans were to be negotiated for the sum required, £350,000, which was to be paid into the hands of the receiver general and drawn by the commissioners according to the progress of the work.[147]

At first construction of the Cornwall Canal proceeded briskly. However, as noted elsewhere, the depression of 1837 combined with the Canadian rebellions of that year made it impossible to sell Canadian provincial securities in London. Once the sources of capital dried up, work on the canal was suspended but not before the province had paid out $1,448,538 on the project.[148] It was resumed after the union of the provinces and completed in 1843.

Before leaving the subject of expenditure on canal construction, a few final remarks might be made regarding the amounts paid out by the provincial and imperial governments for waterway improvements in the Canadas prior to 1841.[149] The Province of Lower Canada expended a total of $889,110.58 on waterways and the Province of Upper Canada paid out $3,430,952.57 for the same purpose. The imperial government, during this period paid out no less than £1,069,026, a figure which included work done on the Ottawa-Rideau waterway and contributions to the Lachine and Welland canals.

Problems in the Construction of Canals: Land and Contracts

I

One of the most tedious and troublesome aspects of canal construction was the acquiring of land through which to build the waterway. In the case of the Rideau, getting land proved to be the most time-consuming and unrewarding of the duties which devolved on Colonel By. From the very beginning he realized that it would be a major and ticklish problem and he wrote to the lieutenant governor, Sir Peregrine Maitland, about it on 2 January 1827.[1] Maitland had already received communications from the British government and from the governor-in-chief, Lord Dalhousie, requesting him to afford By every aid and assistance within his power in procuring the required land.[2] In his letter to Maitland, By expressed the belief that judging from the difficulty he had encountered in obtaining information relative to the proprietors of the land through which he proposed to cut the canal, the work could not progress as rapidly as the British government desired without some regulative Act authorizing him to take possession of any amount of land which he might require. By believed that "a Bill to that effect will meet with less opposition before the line of Canal is correctly ascertained, than when each individual can judge of the advantages or disadvantages he, or his neighbours, may sustain from the proposed Canal."[3] Maitland apparently acted quickly. On 17 February 1827, the legislature of Upper Canada passed the Rideau Canal Act.[4]

Although the canal was for the British government, the Act gave to Colonel By, as a representative of the King, "all the powers which the Upper Canada government would have possessed had it undertaken the work."[5] The first section of the Act stipulated that the officer employed by His Majesty to superintend the work was authorized to set out and ascertain such parts of the country through which the canal was to pass, "as he shall think necessary and proper for making the said Canal, Locks, Aqueducts, Tunnels and all such other improvements, matters and conveniences as he shall think proper and necessary for making, effecting and preserving, improving, completing and using in the said navigation."[6] The third section of the Act declared that "such parts and portions of land or lands covered with water, as may be so ascertained and set out, by the Officer employed by His Majesty, as necessary to be occupied for the purposes of the said Canal, and also such parts and portions as may upon any alteration or deviation from the line originally laid out for the said Canal, be ascertained and set out as necessary for the purposes thereof shall be forever thereafter vested in His Majesty."[7]

By could therefore demand any land he required for the Rideau Canal. The provincial statute stipulated, however, that the arbitrators for fixing the value of the lots taken could not be appointed till the canal was completed. Accordingly, some proprietors were reluctant to dispose of their land though it was perfectly clear that there would be no difficulty in adjusting eventually the claims of the proprietors, if By could show that the land he had taken was required for carrying on the work.[8] At the same time, By could make an immediate purchase of the land required for the canal provided this could be done on reasonable terms.[9] Previous to closing any such bargain, however, he was required to make a special report accompanied by a regular survey for His Majesty's consideration. For example, on 31 March 1829,[10] the military secretary informed the commanding Royal Engineer in Canada that after perusing the documents relating to the purchase of certain lots of land in the vicinity of the Hog's Back on the Rideau River belonging to R. D. Fraser and Dr. Munro, His Excellency approved of the purchase made by Colonel By of the front of Fraser's two lots containing about 45 acres for the sum of £400 sterling. Later in September,[11] a similar communication between the same two officers contained His Excellency's approval to purchase Dr. Munro's land comprising 900 acres for £1,000 sterling and the remainder of Fraser's land comprising 455 acres for £380 sterling. Since the Hog's Back was a leading feature of the canal, the government needed land there on which to construct defence works at a future time and to settle on it a loyal population interested in protecting the dam and canal. By recommended the granting of small lots of from 25 to 30 acres to persons employed in constructing the canal who were desirous of becoming settlers, provided their settlements were 400 yards from the dams or locks.[12]

By found that some proprietors eventually altered their opinions regarding the sale of land to the government and were willing to accept the true value of their land, instead of asking for ten times its worth, provided they were allowed to lease such parts of the property as were not required for the public service.[13] The government's main purpose for retaining the land was to prevent claims for damages as the canal became enlarged by the wear and tear of steamboats using it. The government also wished to retain the land in order to prevent the erection of buildings in the line of fire of defence works which it might be found necessary to erect in order to protect embankments from being destroyed by an enemy.[14] By was satisfied to lease such portions as were not required immediately, under such restrictions as to enable the government to resume the whole at any time it might require.[15] Moreover, in many cases, By was able to make an advantageous bargain only through purchasing the whole estate and then granting a 30-year lease to the proprietor who paid the annual rent of 5 per cent on the whole purchase price without any deduction being made for such portions as were taken for the public service.[16] For example, Allen McLean preferred to accept £2,000 for the whole of his estate consisting of 2,500 acres instead of the £4,000 he claimed for damages.[17] He was granted a lease of such parts as were not required for the public service. By cited this bargain with McLean as an example of the great utility of property on the line of the Rideau Canal and the objection which proprietors on the line of the canal had to the possibility of others enjoying the advantages which they considered to be their right. By found that offering the proprietors a lease on the said land at moderate terms dissipated unpleasant feeling and lessened their demands. Indeed he believed that this practice reduced by one-half the sum the government would otherwise have had to pay.[18]

Yet legal disputes did at times occur with landed proprietors wishing to profit unduly by selling land for the canal. One such dispute with Nicholas Sparks involved 88 acres of land which By expropriated in the spring of 1827.[19] The greater part of this land was required to form a reservoir to supply the first eight locks with water, and the remainder of the land was required to form works for the defence of the said locks along with wharves, quays and landing places. Section 9 of the Canal Act declared that "in estimating the claim of any individual to compensation for property taken, or for damage done under the authority of this Act, the Arbitrators or Jury assessing such damages shall take into their consideration, the benefit likely to accrue to such individual from the construction of the said Canal, by its enhancing the value of his property or producing other advantages." By learned that Sparks had purchased from Mr. Burrows in 1823 the land in question, being part of 200 acres with a small house and £10 worth of furniture, for the whole of which he paid only £85. Now Sparks was asking £600 per acre in consequence of the increased valuation the canal had given to the surrounding area.[20]

When By first arrived on the site in September, 1826, no improvements had taken place on this property except the clearing of a few acres and the building of a smiths' house and shop near the location which By selected for the entrance of the eight locks. He appraised the house and shop and offered to give £250 for them and to allow the proprietor to occupy them for a period of 5 years rent free. But no title to the buildings was produced and so no purchase took place. Sparks urged By to pay him for the 88 acres taken for the use of the canal, and By offered Sparks £1 per acre and payment for all clearing, fencing or whatever other expenses Sparks may have laid out on such land. Sparks, however, refused to accept this offer and insisted on receiving £600 per acre. By declined to give Sparks this amount conceiving it to be an unreasonable and exorbitant demand. By finally called upon the attorney general of Upper Canada to defend the action Sparks was determined to bring against him.[21]

In standing up to Sparks, By had the full support of Colonel E. W. Durnford, commanding Royal Engineer in Canada. This officer wrote to the military secretary on 25 June 1829,

I have to express my regret that Mr. Sparks should have demanded so enormously for this property when the whole operations that Government had entrusted Lt. Col. By to execute have been so prodigiously beneficial to Mr. Sparks as well as most if not all others from whom property will be of necessity taken in furtherance of the Rideau Canal. I think it is my duty to make these observations in order, if His Excellency approves thereof, he may impress them upon the Committee in any instructions he plans to give them.[22]

Whereupon on 2 July the military secretary wrote to Sir John Colborne, lieutenant governor of Upper Canada:

Adverting to the letter which I had the honor to address to Your Excellency on the 13th Ultimo, upon the formation of a Committee to appraise the land required for the Rideau Canal, I am directed by the Commander of the Forces, to acquaint Your Excellency, that the Commanding Royal Engineer has nominated Captain Piper as the Officer of the Royal Engineers recommended to be placed upon that Committee. I am at the same time commanded to transmit to Your Excellency copies of reports from the Commanding Engineer and from Lieutenant Colonel By upon the land belonging to Mr. Sparks acquired for the service in question the substance of which His Excellency will be pleased to impress upon the minds of the Committee.[23]

In another case William Needham claimed for damages for injury to his land from the Rideau Canal. In this instance, By directed J. Hagerman, the ordnance solicitor for the Rideau Canal, to write to Needham desiring to be informed of the lowest terms he was willing to take for his property, or for compensation for damages occasioned by the rising of the water in Cataraqui Creek by the dam at Kingston Mills. Needham asked £800 for the property in question, which By valued at £400. Later Needham became more exorbitant in his demands stating that his crop of turnips would produce 4,000 bushels per acre and valued them at 1s. per bushel. As he had three acres of turnips, according to his calculation, it would take £600 to pay for that crop alone. On examining the said three acres, By found that it did not appear that 100 bushels could be obtained off the land. Thereupon By accused Needham of attempting to impose on the government and said that he would have nothing more to do with Needham who must lay his claims before a jury at the completion of the canal as stipulated by the Rideau Canal Act. At the same time By declared that he considered it to be his duty to settle Needham's claim the moment Needham would accept an equitable price.[24] Sometime later, Hagerman received from J. Cartwright of Kingston, solicitor for Needham, a statement of claim for damages to the amount of £545.12.0. Accompanying the statement was a certificate from Messrs. Tuttle and Marks, who were acquainted with Needham's land, stating that the various items listed in the claim were just and reasonable. Cartwright pointed out that had Needham accepted By's offer of £400 last fall, it would have been of more actual benefit to him than the £545.12.0. he was now asking. In consequence of not receiving satisfaction for his damages, Needham had been imprisoned upwards of three months, his cattle had been seized and sold under executions, his family dispersed and his business totally ruined. He was now in a state of want with demands accumulated by costs still unsatisfied which he could have settled had he accepted the settlement in the fall. Needham's lawyer now wished for a settlement which would pay Needham's debts and secure his release from prison.[25]

In July 1831 Colonel By reported to his superiors in Quebec that there was a piece of land held by Peter Cornish of which Edward McCrae, the original proprietor, was extremely anxious to assume possession for the sole reason of claiming heavy damages for the water of the Rideau Canal overflowing the greater part of it.[26] Cornish's power of purchase would cease next September unless it was completed by that time. But Cornish had not the means of completing the purchase and had offered it to the ordnance for £150. By proposed that the ordnance should purchase from Cornish in order to prevent McCrae from bringing an action against the government for damages, and this was done.[27]

The Royal Navy was also among the claimants for damages. In 1830 Commodore Barrie at Kingston wrote to By that "the Naval Department will look to the Ordnance Department for the Payment of all damages done to the said property (at Kingston Mills) by the Ordnance Department."[28]

Lands taken for the Rideau Canal could not be let or leased without the concurrence of the commander of the forces or the ordnance officers at Quebec. In one case, lots Nos. 34, 35, 36, 37 and parts of 39 and 40 containing about 1,000 acres were purchased from Cornelius Phillips in the township of North Gower for the sum of £200. Ordnance then requested permission to let to James, Patrick, Edmond and Michael Murphy, for the sum of 12s. per annum as a rent for 60 acres of the land now shared and a further sum of 1s. per annum for every acre which might hereafter be cleared at their expense. Ordnance believed that this arrangement was for the benefit of the government.[29]

Sometimes By became involved in legal disputes when removing intruders from lands of which he had taken possession. The question was: How much land could he take? The attorney general of Upper Canada filed writs of Information of Intention, until the right be determined in a court of law, against persons who repossessed themselves of lands set apart and required, in By's opinion, for the use of the canal. He desired to take lands at certain points in order to fortify the canal and the attorney general maintained that if By would in the words of the Rideau Canal Act "set out and ascertain" some given site where he thought such a work most necessary, and taking as little ground as possible, then he, the attorney general, would file an Information for By against any person who intruded upon it.[30]

ii

The construction of the Ottawa canals led to claims for damages from property owners adjacent to them. By virtue of an order in council passed in 1829, the Crown resumed additional land at the Carillon.[31] The whole area between the canal and the river was taken in order to prevent obstructions and nuisances in the vicinity of the locks. However, no more land was taken from the proprietors than was necessary for the purposes of the canal and no land was taken which might be required for purposes of defence. Quite naturally demands for compensation arose from the proprietors of the resumed lands. The government therefore appointed Mr. Brown of Beauharnois to act as its arbitrator in settling the claims.[32] He visited the Carillon in October, 1830, where he met with considerable hostility from the closely knit group of local proprietors mutually determined to extract excessive compensation from the government. Brown thereupon deemed it useless to proceed any further in his attempt to arrive at an equitable settlement of claims and promptly left the scene.[33] In the following year a fresh order in council was passed for the resumption of such land as was required but not sanctioned by the former order, as well as for the relinquishment of such land as was before included but was not now required. Renewed demands for compensation were now made by the proprietors who entered a suit for damages in the Court of Kings Bench at Montreal. Whereupon the court ordered an arbitration of the dispute and in the spring of 1832 the proprietors obtained a favourable judgement.[34]

Tedious and protracted claims for damages were forthcoming from the proprietors at the Chute-à-Blondeau. Simon Fraser of Terrebonne claimed for damages done to his property by the construction of the canal.[35] Concomitant claims were also made by James Fuller and Solomon French who had purchased lots from Fraser. In October, 1830, Mr. Brown, following his unsuccessful attempt at arbitration at the Carillon, accompanied Colonel DuVernet, commander of the Ottawa canals, to the Chute-à-Blondeau, where he met with Solomon French. French's demand for compensation appeared to Brown unreasonable and, being unable to find an impartial person on the spot to call as a third arbiter, he suspended the whole business.[36] In 1834 the ordnance paymaster of the Ottawa canals informed Fraser that the government was ready to pay him and the other two gentlemen the sum of £129.12.6 for the land.[37] Fuller and French, however, were really more interested than Fraser in this final settlement, and they would not agree to so small a sum as compensation for the loss they had sustained.[38] Thereupon, Fraser, after consulting with Fuller and French, decided not to accept the money offered by the ordnance paymaster believing that to do so would make him liable in action for damages to Messrs. Fuller and French for injury done to their property.[39] Fraser decided to submit the matter once again to the governor-in-chief.[40] A few months later, in March, 1835, Fuller expressed his case in a letter to the ordnance office.[41] He had had his mill site examined several times by competent persons who had estimated it as worth £2,000. At one time he had built a lime kiln and had made preparations for building a mill. This work, however, had been suspended in consequence of the construction of the canal. He therefore had to construct these works at another location where his trade was confined and crippled through lack of water. Construction of the canal had thus broken up his mill and tan works. After stipulating what he was ready to accept in the way of compensation, Fuller went on to say that had the Ottawa canals been used exclusively for "military works of defence, he should have little to say, but it was notorious that these canals were used by the government for purposes of trade and profit."[42] He expressed his belief that "no Court of Justice under the Crown would permit the property of the subject to be taken from him and applied to such uses."[43] The matter should, according to Fuller, undergo a proper legal investigation and the question be decided upon by a jury. Fraser could not dispose of or compromise Fuller's rights nor had Fraser received any money for the land taken at the Chute-à-Blondeau. This fact continued to perplex the authorities. On 15 May 1835,[44] Colonel Nicolls, commanding Royal Engineer in Canada, informed the commander-in-chief of the forces that though Simon Fraser had been notified several times that payment for the land taken by the Crown was awaiting him, he had not yet called upon the ordnance paymaster to receive it.

There was also a claim regarding the Grenville Canal from a proprietor, Claude Greece.[45] On 10 June 1829, this gentleman complained to Colonel DuVernet, commanding officer of the Ottawa canals, that the water from the canal leaked through the banks so as to cause the destruction of his crops and to render useless a considerable and valuable area of land. When Greece first detected the leakage he set about cutting temporary drains which did not help much, and as a result aquatic weeds soon grew where formerly had been crops of wheat. Greece complained that other parts of his land, which were previously sound and dry, were now always under water whenever the canal was full. He said that this injurious effect often attended canals unless very great care was taken in the formation of their banks. He maintained that it was customary in England for those who constructed canals to secure, by ditches parallel to them, the property of the persons through whose lands they passed. Greece, however, found that little was being done by Colonel DuVernet to remedy the situation. He therefore placed his complaint before Lord Aylmer stating that "although the Crown has a reserved Right for Military Canals, that the King's subject may not materially suffer through their leakage, and that Your Lordship will be pleased to permit that some competent and impartial person do in the opening of the season inspect the damage complained of, and order such relief by Drainage or otherwise as the circumstances require." Colonel DuVernet's opinion, based on his knowledge of the ground and the survey taken before the canal was cut, was that the annoyance Greece complained of did not altogether result from the leakage of the canal bank but from the natural lowness of the land. He actually believed the Greece property, as well as that of the other proprietors similarly situated along the Grenville Canal, must be greatly improved rather than injured by the said canal.[46] Greece died shortly following his petition to Aylmer, whereupon his heirs made a claim, which seems to have been granted, for a considerable piece of vacant land in compensation for that which they maintained the canal rendered unfit for agriculture.

III

"An Act for making a Navigable Canal from the neighbourhood of Montreal to the parish of Lachine" (1 Geo. IV, C.6),[47] provided for the appointment of commissioners to superintend the construction of the work. Once appointed the commissioners lost no time in choosing a committee to confer, at Côte St. Paul, with the proprietors along the line of the canal regarding the purchase of land required for the waterway.[48] On 8 June 1821, the committee reported that the proprietors would propose no price but would willingly agree to the appointment of arbitrators to make an evaluation of such grounds.[49] Three days later, the proprietors came to the canal office and the arbitrators for evaluation of their grounds were then appointed: Hugh Brodie and Paschal LaChappelle on the part of the canal commissioners, and Joseph Alard and James Milne on the part of the proprietors.[50] These gentlemen were farmers, resident in the parishes of Montreal and Lachine, and not interested in any lands through which the canal was to pass. The arbitrators were empowered to appoint an umpire. It was agreed that once the arbitrators were appointed both parties would abide by their award and that of the umpire in cases wherein they might differ in opinion.[51]

On 14 June 1821, a meeting took place at Lachine of the commissioners, secretary, engineer, proprietors of land and the arbitrators. On this occasion the arbitrators chose N. B. Doucet, notary public, as umpire.[52] The commissioners suggested that the first task of the arbitrators was to define the evaluations of damages which might be incurred by needful removal of buildings, orchards, gardens or some other cause.[53] Persons present at this meeting went to view the proposed line of the canal by Côte St. Paul where the arbitrators began their examination of the several properties pointed out to them. Once made, the award or decision of the arbitrators for evaluation of the ground was transmitted to the Court of King's Bench, as directed by the Act.[54] The decision was also conveyed to the interested proprietor.

Early in August the proprietors made applications for payment of lands to be taken for the canal. The engineer was directed to make a return of the breadth of each man's property. Meantime part payment was to be made leaving the residue of payment until the canal should be completed and the precise quantities of ground finally required and taken were ascertained.[55]

Though the commissioners believed that the arbitrators had acted conscientiously in their valuations, these were higher than had been expected.[56] Even so, some proprietors were so selfish and greedy that they expressed dissatisfaction with the appraisal of their lands. Whereupon the commissioners became alarmed at the probable magnitude of the claims and awards which might be made for the value of the property. The commissioners believed that the proprietors "would be awarded too much as the current of feeling runs too strongly in favor of claimants, at the expense of the public interests."[57]

The first projection of the Lachine Canal had intended to place the terminus at the foot of the current Ste. Marie with a branch running from the main line to a point on the river near the actual entrance. But the prices asked for land were at the time considered so exorbitant that it was deemed necessary to shorten the canal and change the location of the terminus. This was done by the Act cited above (1 Geo. IV, C.6). Yet the importance of continuing the canal to the lower location was so apparent that two years later, in 1823, an Act was passed which directed that measures should be taken to ascertain the value of the land required in obedience to this Act.[58] The canal commissioners then appointed Messrs. Julius Quesnel and Thomas Phillips commissioners to obtain the required information.[59] These gentlemen reported that the proposed extension would pass through 87 different properties; that the value of the land amounted to £12,547, and the value of the houses amounted to £3,821 making in all £16,368. They strongly urged the purchase of the land with a view to future extension of the canal.[60] The suggestion, however, was not carried out.

Through their inflated prices for land, some of the proprietors, therefore, determined the eventual route of the Lachine Canal. As finally constructed, the lower entrance was comparatively high up the river near the foot of the rapids with a swift current to be overcome before it could be reached and entered. Had the canal been extended to some 2¼ miles below the final terminus to the foot of St. Mary's current, as was originally intended, the canal would have entered into a body of still water and the whole Port of Montreal, instead of lying in a current as it did when the Lachine Canal was finally completed, would have possessed an improved body of water.[61]

IV

By the provisions of the Act incorporating "The Welland Canal Company" (4 Geo. IV, C.17),[62] the directors of the company were

> *empowered to contract, compound, compromise and agree, with the owners and occupiers of any land through or upon which they may determine to cut and construct the said intended Canal, with all necessary and convenient locks, towing-paths and other erections and constructions contemplated by this Act, to be cut, erected, constructed and built, either for the absolute purchase of so much of the said land as they shall require for the purposes of the said Company, or for the damages which he, she or they, shall and may be entitled*

to recover from the said company in consequence of said intended canal. No sooner had construction begun than claims for damages poured in to the company from proprietors along the course of the canal from the Welland River to Lake Ontario.[63] Thereupon, in accordance with the provisions of the Act passed on 30 January 1826 (7 Geo. IV, C. 19),[64] an arbitration was held at St. Catharines in August of that year to determine the amount of damages to be paid by the company. With the exception of a very few individuals (one and only one claim was quickly settled for the sum of £600), all persons with claims in respect to that portion of the canal from the Welland River to Lake Ontario submitted them to the arbitrators. The final award directed the company to pay damages amounting on the whole to £1,794.[65]

Meantime the directors of the company had applied to the lieutenant governor for a grant of crown land comprising roughly 13,000 acres in the township of Wainfleet on that part of the canal which was to connect the Grand River with the Welland. In their memorial for this grant of land the directors pointed out that thus far the British government had given no support to their undertaking, whereas the granting of the petition would not only indicate the interest that the imperial government took in the canal company's success but would also increase the value of the company's stock, thereby making it easier to sell. The directors also pointed out in their memorial that the value of landed property to the west of the projected canal would increase and the Crown, with lands in that area, would benefit.[66] Whereupon the lieutenant governor, at the solicitation of the directors, forwarded to Lord Bathurst the memorial for the grant of an extensive tract of land. The final grant of 13,400 acres proved to be most fortunately situated, the line of canal running nearly through the centre of it.[67]

Finally, the Act of 20 January 1826 stipulated how the value of any mill site which the company required to purchase would be ascertained in the event of disagreement between company and proprietor. In such a case arbitrators were to be appointed and these would not only assess the value of the mill site but were empowered to decide whether the person owning the site could be compelled to part with it to the company.

V

The Chambly Canal, in permitting water communication between Lake Champlain and the St. Lawrence River at Sorel, was an important part of the St. Lawrence waterway. From 1787 on, commercial and political reasons were advanced for the construction of this canal;[68] to these, the War of 1812 added a military one. Finally in 1827 the Province of Lower Canada made an appropriation for improving the Richelieu navigation and undertook the work itself.[69] Commissioners were appointed in 1829 to carry out the scheme[70] and the following year work was commenced at St. Ours, 14 miles above Sorel. Once appointed, the chairman of the Board of Commissioners for the Chambly Canal transmitted to the commander of the forces a plan for that portion of the government ground at Chambly that would be required for the canal.[71] Whereupon the commander of the forces requested the commanding Royal Engineer in Canada to send an officer of his department to Chambly to contact the commissioners for determining the boundaries of land belonging to the Crown which would be required for the proposed canal.[72] This land had actually been transferred to the Board of Ordnance and was in the keeping and custody of the board's officers of which the commanding Royal Engineer in Canada was one.[73] The engineer officer sent to contact the commissioners was to delineate the land required for the proposed canal, on the plan furnished by the commissioners, for the approval of the commander of the forces. This was done and the required land placed at the disposal of the canal commissioners.[74] From then till 1841, work on this canal was carried on in a very unsystematic way and it remained for the Board of Works, formed after the union, to complete the undertaking.

II
I

The awarding of contracts to persons prepared to undertake the work was an important aspect of canal construction. The spring of 1827 found Colonel By in Montreal busily engaged in this task. Local newspapers carried a notice explaining how the awarding of contracts was to be done. "It is best to allow no contractor to have anything to do with them (the Works) be his cash or consequence what they may, unless he is well known as a practical artist, competent for what he professes."[75] The notice also summarized the work to be done as follows: "The works of the Rideau Canal seem to divide themselves into the following great branches; building and finishing of locks of heavy masonry; framing aqueducts and bridges of wood." The government, it was further explained, would supply spirits, provisions and camp equipment; engage surgeons furnished with necessary medicines, and station a subaltern's command of 60 soldiers near each contract work.[76]

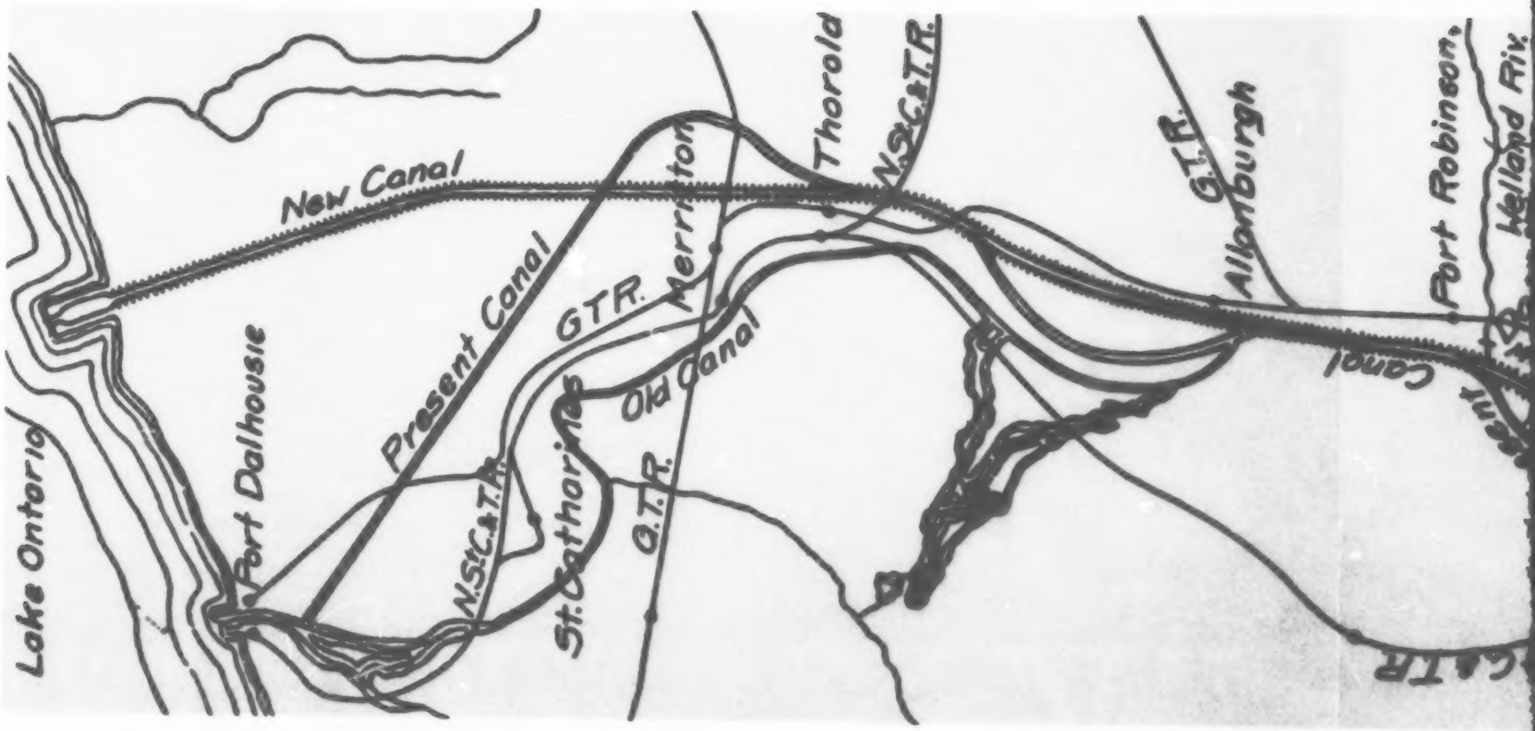
Each contract was an agreement between the commissary general of His Majesty's forces in Canada, for and on behalf of the Crown, and the named contractor who guaranteed to carry out the stipulated work for the unit sums noted in the document. In one contract the unit prices were 4s. per cubic yard for rock evacuation and 1s. per cubic yard for earth. The contractor was paid these prices for each of the units noted. Engineers would measure the total amount of work completed and the quantity multiplied by the unit price would give the total due the contractor. The contractors on the Rideau Canal and elsewhere, instead of receiving cash, accepted drafts on Montreal which they disposed of at a premium for bank notes, the drafts being payable in dollars on presentation.[77] Prior to leaving Montreal in the spring of 1827 to take up his residence on the bank of the Ottawa, By had the satisfaction of knowing that all the main contracts had been awarded. The minor ones that remained were granted by the middle of the summer.[78]

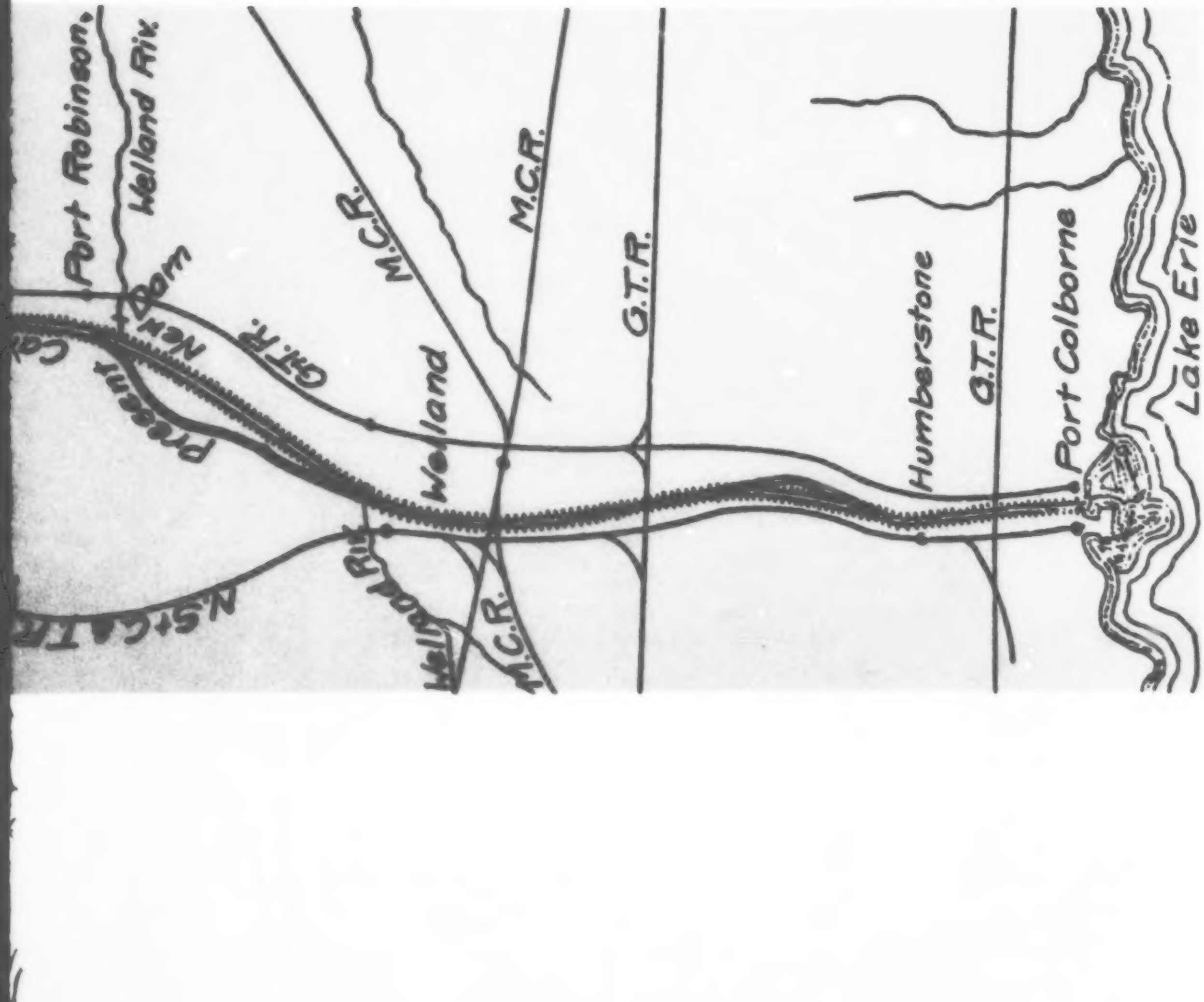
During the summer of 1827 actual work was started on the canal. By informed General Mann that he had a good portion of the work contracted for at moderate prices.[79] He allowed no man to contract for more work than he could execute in three years.[80] Mr. Pennyfether had contracted to excavate the first eight locks from the Ottawa River and to complete the work by 1 August 1827; however, it was found impracticable to finish the excavation by that time due to a great number of springs which created more work and consequently an unavoidable delay.[81] Thomas Mackay, the practical man who built the locks in the Lachine Canal, contracted to build the masonry of the first eight locks and to complete them in two years from the date of signing the contract. However, he too was unable to finish them in that time due to the same unavoidable cause as Mr. Pennyfether's.[82] Mr. Fenelon contracted to clear and excavate the canal from the first eight locks to the north side of Dows Great Swamp. He also contracted to excavate and form the canal from Dows Great Swamp to the Hog's Back, chiefly rock excavation, forming an aqueduct bridge 20 feet long across Peters Gully, excavating and constructing three locks each of 10 feet lift, and forming a dam of arched key work across the Rideau River 240 feet wide and 40 feet high.[83] This dam was to convert 7 miles of rapids into a sheet of still water and thereby save the expense of excavating the canal for that distance. Mr. Henderson contracted to cut a drain from the Beaver Meadow to the Rideau River to drain the swamps through which the canal had to pass. This work was expected to be completed in August. This gentleman also contracted to form a mound of earth across Dows Great Swamp and to construct the canal on the top of this mound.[84] Mr. Phillips, a Montreal mason, opened quarries at the foot of the Black Rapids in order to construct a dam across the Rideau River 280 feet wide, 10 feet high and a lock of 10 feet lift. This dam would throw back the water and form a sheet of still water 5 miles long which would complete the canal to the foot of Long Island Rapids where By proposed to construct locks of 8 feet lift each and a dam across the Rideau 158 feet wide and 24 feet high. This would throw back the water 3 miles, convert that length of rapid into still water and give an uninterrupted navigation for 23 miles to Colonel Burritt's house on the banks of the Rideau 44 miles from the Ottawa and 144 feet above the river.[85]

By also informed Mann that he intended to perform by day-work, and under the immediate supervision of himself and his officers, all the piling of the foundations and laying of the stones forming the coffer-dams and waste weirs. He reported that the large blocks of hard grey limestone, granite and sandstone that the various quarries produced would enable him to erect both desirable and ornamental works. In conclusion By expressed his anxious waiting for the arrival of the second company of Royal Sappers and Miners.[86] Two companies had been raised in England especially for work on the canal, each consisting of 81 men. The 15th company arrived on the site on 1 June 1827; the 7th company on 17 September. These two companies were amply employed in constructing lock gates, sluices, waste weirs and stone bridges across the canal.

In March 1828 By received from General Mann a letter suggesting that he try to prevent as far as possible incurring any expense upon the canal beyond what it had been intended to grant in that year, and to limit his engagements in contracts.[87] The letter did not reach By, however, before all the contracts for the masonry of various locks, the construction of the different dams, and the clearing, grubbing and excavating had been accepted and closed by the deputy commissary general at Montreal on 1 February. Up to now, By had acted on the assumption that he should press the work to the utmost. Upon receiving Mann's letter he discharged all his civilian carpenters, smiths, labourers and squad masters. At the same time, he

22 Plan of the proposed route of the Welland Ship Canal.
(*Sessional Paper* No. 20, 1914.)





Port Robinson.
Welland Riv.
New Dam
G.T.R.
M.C.R.
M.C.R.
M.C.R.
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Welland Riv.
N.St.C.&T.R.
G.T.R.
Humberstone
G.T.R.
Port Colborne
Lake Erie

such overwhelming confidence was in some cases badly misplaced.

It was perceived in the early stages of construction that to proceed with the dispatch which the contractors pressed upon the company, and which it was evidently the interest of the latter to facilitate, would demand a larger expenditure than could be provided for from the existing funds. At the same time it was strongly urged upon the directors by the principal stockholders that no necessary expense should be spared in procuring engineers "of competent ability and of known character." Accordingly, early in the season of 1826, Alfred Barrett, long employed on the Erie Canal, was engaged as the principal resident engineer under whose immediate and constant superintendence the whole of the work proceeded. David Thomas, the principal engineer, was engaged at an annual salary to visit and report on the state and progress of the work and to suggest any improvements on the original design.[93]

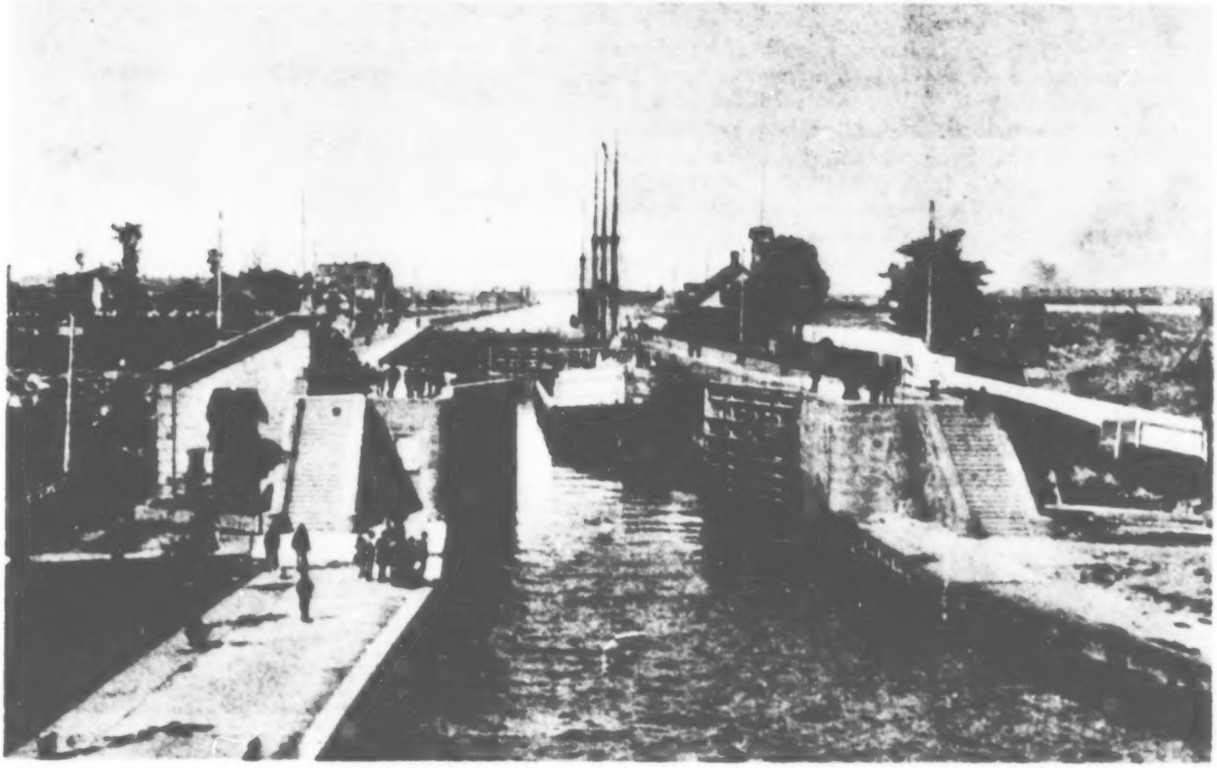
During 1826 considerable progress was made. By October, 330,704 cubic yards had been excavated out of an estimated total of 1,457,238, and 202,707 yards of embarkment had been completed leaving 155,445 yards still to be constructed. Of the first section which commenced at the Welland River and was 66 chains in length, one-half was completed, the towing path finished and the water let in. The second, third, fourth, fifth and sixth sections formed the Deep Cut where the greater part of the labour force was concentrated. Here just under half of the excavation was completed and bottom land had been reached at one point. On the 5-mile section descending the escarpment, four locks were completed by the end of the year except for their gates. It was believed that the St. Catharines-Lake Ontario section with the layer locks would be navigable during the following season. The full amount of capital stock not being subscribed, the directors at this time did not proceed to contract for the western section of the canal leading from the Welland to the Grand River. Later, however, as the necessary funds became available, the directors let contracts for that part of the work since it was apparent that neither the company nor the public would reap the full benefit of the Welland project until that part of the canal was finished.[94]

By September, 1827, work was so far advanced on the northern, or Lake Ontario-Welland River section, and the necessary funds being available, tenders were called for the southern or Grand River section. Contracts for this section were let to Messrs. Manson, Simpson and Company on 4 October, and a beginning was made on the slow job of draining the swamp. By December, however, work on this section was halted through financial difficulties but not before 72,000 cubic yards of earth had been removed and drainage ditches carried into the swamp for three or four miles.[95] Meanwhile the American contractors who had undertaken the Deep Cut, Messrs. Beach, Ward and Hovey, expressed their inability to carry on the work any further at the contract price. They were bankrupt and could not possibly meet the specified date for completion.[96] At the same time, the section from St. Catharines to Lake Ontario was already in use. Only the Deep Cut remained unfinished and was the one obstacle to the completion of the canal.

When the 1828 season opened all energies were concentrated on the Deep Cut. Philps the contractor and Barrett the engineer recommenced the work late in April. By October two sections of the cutting were completed.[97] If the Deep Cut could be finished by the end of the year, then the first two sections of the canal from Lake Ontario to the Niagara River could be opened for traffic in 1829. However, suddenly on 9 November the banks of the Deep Cut collapsed. This disaster meant a complete stoppage of work. The real source of trouble lay in the fact that excavation of the bottom of the cutting had reached a bed of loose sand and as soon as the level was reached and water allowed to enter, the sand was carried away in the form of silt and the high banks were undermined.[98]

The original plan for the canal had now to be changed. Instead of using the Welland River as a feeder, which necessitated lowering the level of the Deep Cut to the level of that river, now impossible because of the sand, a new feeder had to be found to bring in a supply of water at a higher level, thus enabling the bottom level of the Deep Cut to be raised. The directors now called upon James Geddes, an experienced engineer, for assistance, and he along with Barrett ran new surveys in November and December. The engineers found the key to the situation in the Grand River section which depended on Lake Erie, not the Welland River, for its water supply. However, the level of the Lake Erie above the sand level in the Deep Cut was not sufficient to give the desired 8-foot level, even if the feeder were brought in directly from the lake. In their reports submitted early in 1829 the engineers, therefore, proposed to build a dam across the mouth of the Grand River to raise the water 5 feet above Lake Erie. Then a long cutting could be made direct from this reservoir to the Deep Cut passing over the Wel-

23 The Sault Ste. Marie Canal and locks. From the *Dominion Illustrated*, 22 August 1891. (*Public Archives of Canada.*)



asked the contractors not to increase their expenditures while promising to prolong the period for completing the contracts. The contractors, however, resisted this idea. By feared that there would be great difficulty in getting the contractors to slow down for they believed that the quicker they did the work the greater their profit. When By suggested that they take a longer time to complete their contracts, the contractors replied that they could finish them in one year but that if they were interrupted they would incur great losses and should therefore demand damages. By, however, was not unduly alarmed by this threat. He felt that most of the contractors would find it difficult enough to execute all the works they had undertaken in the time allowed them by their contracts.[88] He decided that not to give them any pretence for delaying the work, as by so doing they would claim damages, would be the surest way of keeping down the expense. He reasoned that by withholding his issues of cash strictly to the terms of their contracts, the contractors would not proceed as rapidly as they had intended.[89]

Contracts awarded for the work were prepared by the Commissariat Department at Quebec and not by Colonel By. He had no control over the amount of work done by the contractors each year. The contracts provided that the contractors should be paid as the work progressed on a unit basis, that is to say, so much per cubic yard for excavating earth or rock. The masonry work in connection with the locks and the dams was similarly treated. Many of the contractors discovered that their figures were much too low, and in consequence found they were losing money and discontinued their contracts, thus causing delay. Or, By would have to remove them from the project they had started because of unsatisfactory progress. Though the provisions in the contract clearly spelled out the contractor's responsibility, yet By was continually besieged by those who had failed, or by their creditors.[90]

ii

In July, 1825, construction on the Welland Canal was begun in earnest after agreements were signed with the contractors which called for the completion of the Welland River-Lake Ontario section by August, 1827. Two months later work was begun on the Deep Cut, and by the end of 1825 excavation was in progress at a number of points along the line. Following are the names of the original contractors on the Welland Canal with their sections.[91] These were numbered from the Welland River and varied in length according to the depth of cutting and amount of work.

At first the directors had complete confidence in the contractors who were described as being "persons as eligible in all respects as they think the Board could have met with. . . . They have exhibited a knowledge of their several descriptions of work and have practised to this time a regularity, economy and a persevering industry in the conduct of it, which it is believed have not often been excelled."[92] It was not long, however, before the directors were to learn that

Sections	**Contractors**
No 1, 2, 3 , 4, 5, 6 (the Deep Cut)	Messrs. Beach, Ward and Hovey
7	Kennedy and Company
8	James Simpson
9, 10	Hall Davis
11, 12, 15, 16, 20, 24, 25	Wallace Bell, Thomas Griffiths, William Richardson, Nicholas Walton, Joseph Carr
13	William Simpson
14, 17, 18, 19, 21, 22	John Gooding, Levi Taylor, Richard Hathaway, ——— Sayer
23	James Simpson
26, 27	Davis and Simpson
28	Hannan and Company
29, 30	Houg and Company
31	Davis and Simpson
32	Gooding, Houg, Biglow and Jones
33	Porter and Donaldson
34	John Tembrock
35	Beach, Ward and Hovey
The Harbour	Beach, Ward and Hovey
The Locks	Oliver Philps and Company

such overwhelming confidence was in some cases badly misplaced.

It was perceived in the early stages of construction that to proceed with the dispatch which the contractors pressed upon the company, and which it was evidently the interest of the latter to facilitate, would demand a larger expenditure than could be provided for from the existing funds. At the same time it was strongly urged upon the directors by the principal stockholders that no necessary expense should be spared in procuring engineers "of competent ability and of known character." Accordingly, early in the season of 1826, Alfred Barrett, long employed on the Erie Canal, was engaged as the principal resident engineer under whose immediate and constant superintendence the whole of the work proceeded. David Thomas, the principal engineer, was engaged at an annual salary to visit and report on the state and progress of the work and to suggest any improvements on the original design.[93]

During 1826 considerable progress was made. By October, 330,704 cubic yards had been excavated out of an estimated total of 1,457,238, and 202,707 yards of embarkment had been completed leaving 155,445 yards still to be constructed. Of the first section which commenced at the Welland River and was 66 chains in length, one-half was completed, the towing path finished and the water let in. The second, third, fourth, fifth and sixth sections formed the Deep Cut where the greater part of the labour force was concentrated. Here just under half of the excavation was completed and bottom land had been reached at one point. On the 5-mile section descending the escarpment, four locks were completed by the end of the year except for their gates. It was believed that the St. Catharines-Lake Ontario section with the layer locks would be navigable during the following season. The full amount of capital stock not being subscribed, the directors at this time did not proceed to contract for the western section of the canal leading from the Welland to the Grand River. Later, however, as the necessary funds became available, the directors let contracts for that part of the work since it was apparent that neither the company nor the public would reap the full benefit of the Welland project until that part of the canal was finished.[94]

By September, 1827, work was so far advanced on the northern, or Lake Ontario-Welland River section, and the necessary funds being available, tenders were called for the southern or Grand River section. Contracts for this section were let to Messrs. Manson, Simpson and Company on 4 October, and a beginning was made on the slow job of draining the swamp. By December, however, work on this section was halted through financial difficulties but not before 72,000 cubic yards of earth had been removed and drainage ditches carried into the swamp for three or four miles.[95] Meanwhile the American contractors who had undertaken the Deep Cut, Messrs. Beach, Ward and Hovey, expressed their inability to carry on the work any further at the contract price. They were bankrupt and could not possibly meet the specified date for completion.[96] At the same time, the section from St. Catharines to Lake Ontario was already in use. Only the Deep Cut remained unfinished and was the one obstacle to the completion of the canal.

When the 1828 season opened all energies were concentrated on the Deep Cut. Philps the contractor and Barrett the engineer recommenced the work late in April. By October two sections of the cutting were completed.[97] If the Deep Cut could be finished by the end of the year, then the first two sections of the canal from Lake Ontario to the Niagara River could be opened for traffic in 1829. However, suddenly on 9 November the banks of the Deep Cut collapsed. This disaster meant a complete stoppage of work. The real source of trouble lay in the fact that excavation of the bottom of the cutting had reached a bed of loose sand and as soon as the level was reached and water allowed to enter, the sand was carried away in the form of silt and the high banks were undermined.[98]

The original plan for the canal had now to be changed. Instead of using the Welland River as a feeder, which necessitated lowering the level of the Deep Cut to the level of that river, now impossible because of the sand, a new feeder had to be found to bring in a supply of water at a higher level, thus enabling the bottom level of the Deep Cut to be raised. The directors now called upon James Geddes, an experienced engineer, for assistance, and he along with Barrett ran new surveys in November and December. The engineers found the key to the situation in the Grand River section which depended on Lake Erie, not the Welland River, for its water supply. However, the level of the Lake Erie above the sand level in the Deep Cut was not sufficient to give the desired 8-foot level, even if the feeder were brought in directly from the lake. In their reports submitted early in 1829 the engineers, therefore, proposed to build a dam across the mouth of the Grand River to raise the water 5 feet above Lake Erie. Then a long cutting could be made direct from this reservoir to the Deep Cut passing over the Welland River, the original feeder, by an aqueduct. They could by this plan bring in a supply of water to provide a depth of 8 feet in the Deep Cut. Henceforth the whole canal from the mouth of the Twelve Mile Creek to the Grand River estuary would be from the hydraulic point of view one system, the effective operation of which depended primarily on the Grand River dam, the long feeder from Grand River to the Deep Cut, and the aqueduct over the Welland River. The new plan necessitated additional locks at each end of the Deep Cut, two at the south end to enable vessels to pass from the canal to the Welland River and two at the north end to connect the new higher level in the Deep Cut with the old level from that point to Lake Ontario.[99]

On 31 January 1829, the new feeder line extending from the Deep Cut to the Grand River was put under contract. But construction did not begin until early in May. Work on the final location of the Grand River dam began early in June. Progress on the line of the feeder was delayed by illness among the labourers in the marsh sections. These delays were a serious matter. The company was near the end of its financial resources and the provincial government would extend financial assistance only if the canal was open for traffic in the following season. Meanwhile work was carried on by hasty makeshift credit arrangements. "Each contractor agreed to accept partial payment for work done in proportion to the means at the disposal of the company. Normal contracting procedure was discarded to permit concentration of labor and equipment on sections where the work was lagging, particularly on the line of the Grand River feeder."[100] On 30 November, two schooners finally passed through the canal from Lake Ontario to Buffalo Harbor.[101]

This passage, however, was symbolic only. Much work yet remained to be done on the canal. Especially was this the case in respect to its wooden locks, some few of which were badly constructed in the first place owing to fraud on the part of the contractors.

iii

The commissioners responsible for the construction of the Lachine Canal were appointed on 26 May 1821.[102] They took the first step toward the execution of their duties with the nomination of Mr. Richardson as their chairman on 4 June. A week later, the commissioners inserted in the newspapers an advertisement for contractors to excavate the canal allowing until 30 June for submitting tenders, which time was afterwards extended to 5 July.[103] On 25 June, Thomas Phillips, one of the commissioners, stated that he would tender for the excavation contract and he therefore wished to resign, it being distinctly understood that no person acting as a commissioner could, directly or indirectly, become a contractor. Phillips' resignation was immediately accepted by the commissioners and he was allowed to tender the same as any other person.[104]

On 6 July the tenders for excavation were opened. Explanations of some points not sufficiently explicit were found to be necessary. Such explanations being made, the proposals of Andrew White, Stanley Bagg, Thomas Phillips and Oliver Wait, with the offer of John Fry and Abner Bagg as their securities, were accepted for the whole line of the canal. The rates were as follows:[105]

Excavation in earth of all descriptions	8½d. per cu. yd.
Extra-cutting in earth of all descriptions	7d. per cu. yd.
Excavation in rock of all descriptions	3s. 3d. per cu. yd.
Extra-cutting in rock of all descriptions	3s. per cu. yd.

"Extra-cutting" meant what was done, whether in rock or earth, above the level of the towing path of the canal.

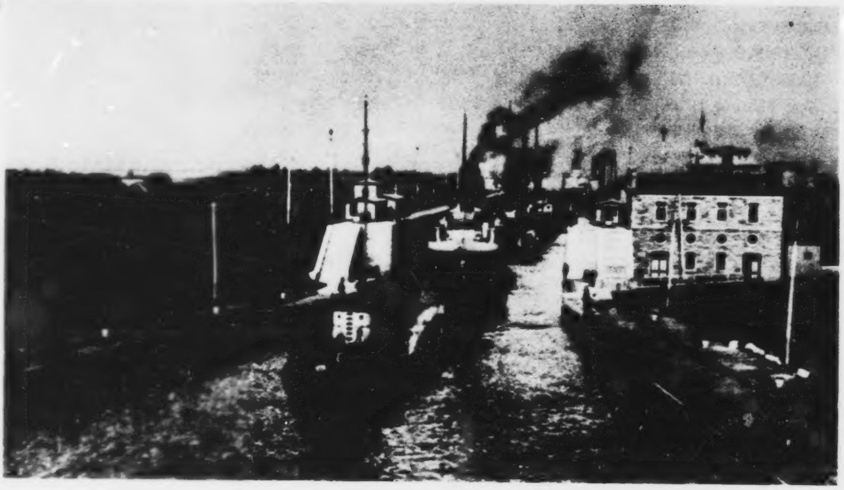
The commissioners found that although some of the tenders had apparently lower costs, they were for short distances where there was no rock, and consequently putting the price at a low rate had no substantial practical meaning. The object of the commissioners was to obtain firm prices for the whole work, including the different descriptions of it, in order to know what the total cost would be. They also wished to avoid, if possible, any collision and dispute likely to result from a variety of unconnected contractors.[106]

Those who had taken the excavation contract were persons of considerable property and so were their securities. The contract stipulated that the contractors undertook all risks and expenses arising from water getting into the works or other accidents. Upon the same principle, a contract was afterwards made with the contractors, it having been previously advertised, for making fences between the canal and contiguous grounds in order to protect those grounds from injury and to protect the commissioners against claims for damage thereto. The cost of this fence according to a prescribed specification of its height, materials and mode of construction was 50 shillings per *arpent* in length, including gates, and keeping the same in repairs until the canal was finished.[107]

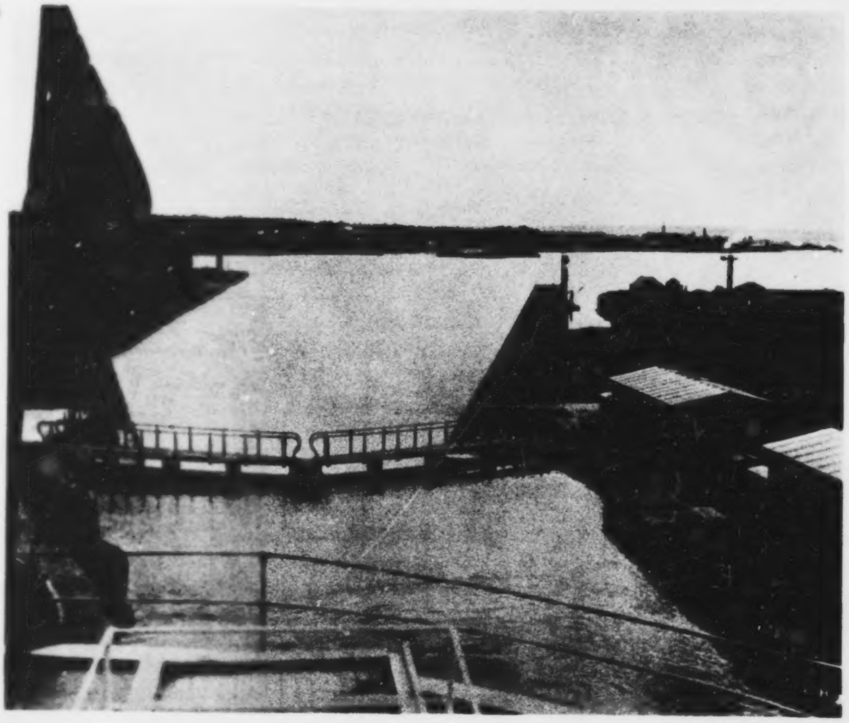
24 A whaleback type of vessel for bulk cargo transport in the Sault Ste. Marie Canal. This class of ship originated in the Great Lakes. (*Public Archives of Canada.*)

25 Locks at Sault Ste. Marie, about 1897. (*Public Archives of Canada.*)

24



25



On 15 October, an advertisement was published for tenders to be made on or before 17 November for furnishing stones fit for the locks. However, information having been obtained that there was a quantity of stone at Caughnawaga of excellent quality, the engineer was directed to examine the same and, his report being favourable, measures were taken for obtaining His Excellency's consent to procure that stone on the usual terms, it being upon the property of the Indians. This occasioned some delay and consequent alteration in tenders, the original ones planning to use the quarries near Montreal.[108]

The commissioners finally accepted the tender of Thomas MacKay, a professional stone-cutter and mason, with James Leslie as his security, at the rate of 5½d. per cubic foot of gray stone, fit for cutting, deliverable at the quarry for different kinds required for the locks, and 30s. per *toise* for stones adopted for the foundations and the backing; reserving for the excavation contractors the right of furnishing according to agreement such stone applicable to locks as should be found in the bed of the canal upon payment to them at the same rate as to the stone contractor, and deducting therefrom the allowance they received for excavation of rock.[109]

Excavation proceeded rapidly in summer but it was not practicable to proceed with it in winter. The quarrying and cutting of stone at Caughnawaga, however, went on during the winter.[110]

When the canal was opened for traffic in August, 1824, the contractor for cutting the stone claimed a large balance due him which the commissioners refused to pay. Thereupon the matter in dispute was referred to arbitration. The contractor's accounts for quarrying and cutting the stone were handed over to the arbitrators who gave as their award that the sum of £501.12.4 was to be deducted from the contractor's claim leaving a balance due him of £2,079.1.5 toward finishing the locks, building houses for the toll collectors and completing other necessary works.[111]

iv

A word might be said about the contracting for repair work to be done on the military canals along the St. Lawrence. The British government owned these canals, received revenue from them and had the responsibility of keeping them in repair.[112] In this matter, however, friction developed between the commissary and engineer departments. The system of placing the military canals at Coteau du Lac, Split Rock and the Cascades in the charge of the commissariat while the responsibility for their good repair was thrown on the engineer department was bad in theory and worse in practice. It was the source of keeping the two departments in continual conflict for many years.[113] In 1832 the captain of Royal Engineers in Montreal complained of being treated as a subordinate officer by the deputy commissary general there. And the following year the commanding Royal Engineer in Canada at Quebec complained of being treated in a similar manner by the commissary general. From the commanding Royal Engineer's point of view, the only solution was for the commander of the forces to direct the commissary general to have all the estimates executed under commissariat on the canals, along with their revenues and repairs, put entirely into the hands of the ordnance like those of the Rideau and Ottawa.[114]

Some military authorities in Canada believed that the provincial legislature of Lower Canada might be disposed to consider a proposal for purchasing these canals. These same authorities, however, also believed that the province's offer to purchase would not amount to more than £15,000 – a sum bearing no relation to their value or revenue which was about £2,500 annually in 1832 and increasing rapidly.[115] The only way by which the British government might have effected this transfer at less sacrifice would have been in the settlement of any outstanding account wherein the Province of Lower Canada might have had a claim against the British government and consented to receive these canals in payment at a fair valuation.[116]

v

In his speech at the opening of the session on 4 February 1817, the lieutenant governor of Upper Canada urged that the water communication below Prescott deserved the serious consideration of the legislature.[117] The following year a joint commission, consisting of Messrs. Thomas Clark and James Crooks for Upper Canada and Messrs. George Gordon and Joseph Papineau for Lower Canada, reported that improvements were necessary at several places along the St. Lawrence. They recommended that canals should be built with dimensions of not less than 90 feet long by 12 feet breadth in the clear at an estimated cost of $600,000.[118]

In 1826, the lieutenant governor of Upper Canada transmitted to the legislature a report on the subject made by Samuel Clowes.[119] Four years later another examination of the inland navigation was made by Alfred Barrett who reported that all the obstructions existing to the navigation between Lake St. Francis and Lake Ontario might be removed so as to allow the passage of Durham boats drawing four feet of water for the sum of £45,198 ($180,792) and of steamboats and schooners for the sum of £173,648 ($694,592).[120]

In 1832 the House of Assembly of Upper Canada resolved "That the public interest requires that the navigation of the River St. Lawrence should be improved so as to admit of navigation by vessels drawing nine feet of water, and that it is expedient to commence such improvements with as little delay as practicable, between Cornwall and the head of the Long Sault Rapids."[121] Accordingly a Bill was passed appropriating the sum of £90,000 ($280,000). In 1833 a commission was appointed to carry out this project.[122] Benjamin Wright was employed as principal engineer and John B. Mills as his assistant. One of the conditions of the Act was that the Cornwall Canal should be commenced and finished before any of the other projected works leading to Lake Ontario should be undertaken.[123] Wright was also employed by the government of Lower Canada to make the survey of the lower canals on a scale to correspond with the canals surveyed for Upper Canada.

In 1833 these engineers reported that the following canals were necessary for establishing a communication between Lakes St. Francis and Ontario: Long Sault (Cornwall Canal), Farran's Point, Rapide Plat, Point Cardinal and Les Galops. The estimated cost for the construction was £323,616 ($1,294,464). Adding to this the cost of the land, the estimated cost in round numbers was £350,000 (1.4 million).[124]

Commissioners appointed to superintend the construction of the Cornwall Canal hired Benjamin Wright as consulting engineer and J. B. Mills as resident engineer. The professional services of Captain Cole, R.E., and of Messrs. Geddes and Fleming were also retained. Tenders were received on 6 July 1834, and the construction undertaken at various rates.[125] The following year the price of labour and provisions had risen so high that the commissioners were induced to add 10 per cent to the prices agreed upon with the contractors. And in 1836, owing to the same causes, the additional allowance was increased to 30 per cent.[126] In that year, Mills, the resident engineer, resigned and Captain Phillpotts, R.E., was appointed in his place. The next three years were difficult ones for the canal commissioners. Political unrest, commercial depression and exorbitant demands for damages to property resulted in the suspension of construction and the discharge of professional personnel connected with the engineer's department.

In his general report on inland navigation in 1839, Phillpotts estimated the cost of completing the Cornwall Canal at £57,300 ($278,860).[127] At the time of union, the estimated expenditure on this canal up to 31 December 1838 amounted to £354,203 ($1,416,812) and it was believed that a further sum of £57,671 ($230,685) was required to complete the works.[128]

vi

In the years immediately following the War of 1812, the necessity of opening a water communication between the St. Lawrence River and Lake Champlain was fully discussed. In 1818 the legislature of Lower Canada passed a Bill granting to a company the right of forming a canal so as to connect the navigation of the lake with the basin at Chambly and avoid the Chambly rapids. The Act prescribed that the locks should not be less than 20 feet in breadth and of a sufficient depth to admit vessels drawing 5 feet of water. The company's capital was limited to £45,000 ($180,000) and the canal was to be completed within seven years.[129] Thereupon the company ordered the necessary surveys and designs and informed the legislature that the cost of construction would far exceed the capital authorized to be raised for the purpose. Hence the company asked for authority to increase its capital. By 1823 construction had still not yet begun and it was clear that the company would forfeit its rights under the clause in their Act which prescribed that the canal should be completed within seven years. A new Act was therefore passed appropriating £50,000 ($200,000) for the construction of the canal.[130] Commissioners were finally appointed in 1829;[131] necessary surveys were immediately proceeded with, and in October, 1831, the works were commenced by contractors who undertook the whole for £46,218 ($184,872). As it turned out, the contractors took the work at very low prices and were soon in financial difficulties. The commissioners made several advances to the contractors to try and keep the work going but to no avail. In the autumn of 1835 the work was entirely suspended. Whereupon the commissioners reported to the provincial government that, along with the £66,000 already expended on the canal, an additional sum of £28,000 ($112,000) was required to finish it.[132] A Bill granting this sum failed to obtain the governor's assent.[133] In the years from 1836 to 1839 the works were maintained by means of small sums of money advanced to the commissioners by the government in anticipation of future grants. In 1840 the commissioners were authorized to borrow a sum of £35,000 ($140,000)[134] and the works were resumed, but again difficulties with the contractors resulted in little progress, and this was the unfinished state of the canal at the time of the union.

Canals in the Province of Canada, 1841-67

I

By 1840 the St. Lawrence grain trade had recovered from the depression of the previous years. In that year, 1,739,119 bushels of grain were exported and the waterway was filled to capacity with supplies of wheat and flour.[1] This sharp rise in St. Lawrence commerce made the completion of the canals along the route a pressing necessity.[2] By 1840, however, the provinces of Upper and Lower Canada could no longer carry the financial burden of canal construction. Only union of the Canadas could ameliorate the problems of canals not only by eliminating separate provincial jurisdictions on the river but above all by providing the increased revenues and sound credit needed for constructing them.

Following his appointment in 1839 as governor general, Poulett Thomson strove to obtain the consent of Upper and Lower Canada to unite as a legislative unit. Upper Canada was assured that the debt incurred by the province on public improvements would be assumed by the united provinces. In 1840 the British Parliament passed the Act of Union creating the new Province of Canada and Thomson, who had been created Baron Sydenham, proclaimed 10 February 1841 as the date on which the union should have effect. In his first Speech from the Throne before the provincial legislature, Sydenham announced that an imperial guaranteed loan of £1.5 million would be made available to the new province in order to reduce the weight of public debt and to promote a programme of public works.[3] In Sydenham's view such a munificent measure would assist materially in welding together the diverse parts of the new province. At the same time the Board of Works for the new province was set up under the direction of H. H. Killaly to take charge of the canal-building programme planned by the government,[4] a programme which called for the deepening and enlargement of the Welland Canal and for the improvement of the St. Lawrence navigation.

The terms of the imperial loan were worked out in the year following Sydenham's announcement. In the summer of 1842 the British Parliament passed the Canada Loan Act making the funds available. Shortly after this the provincial legislature passed a measure to provide that all the money be used directly for public works and that none of it be used to reduce the Canadian debt since the return of prosperous times had improved Canada's financial position and eased her debt burden.[5] The loan could go immediately into canal- and road-building which were now pushed forward vigorously.

II

I

In 1841 the engineers of the Board of Works made estimates of all the works required on the canals in order to accommodate lake-going vessels between Quebec and Lake Huron.[6] After deliberating on the expediency of adopting a new location for the Lachine Canal, they ultimately came to the conclusion to retain the old one.[7] The dimensions of the proposed enlargements of the canal were 200 feet by 45 feet for the locks with 9 feet of water on the sills. The length of canal was to remain 8½ miles but with only 5 locks and an entire lockage of 44¾ feet. The enlargement was commenced in 1843. In 1844, however, due to representation having been made by the Montreal Board of Trade and by the mercantile interests generally while the works were being carried on, locks 1 and 2 were deepened in the sills so as to admit the largest sea-going vessels, which then visited Montreal, into the first basin of the canal.[8] The enlarged canal was opened in the spring of 1848.

From the head of the Lachine Canal across Lake St. Louis to the foot of the Beauharnois Canal was 15¼ miles. This canal was commenced in 1842 and opened in August, 1845. It connected Lake St. Louis and Lake St. Francis and overcame three rapids mentioned earlier, the Cascades, the Cedars and the Coteau. The rapids themselves only occupied a distance of about 7 miles while the two intermediate spaces were tranquil and easily navigated. The canal lay on the south side of the river. It did not follow the bank of the river but ran some distance inland.[9]

Construction of this canal had been seriously considered prior to the Union. In 1833 the Province of Lower Canada appointed commissioners to consider all matters relating to the navigation of the St. Lawrence between Lachine and Cornwall. These commissioners employed as their engineer J. B. Mills, who had been previously employed by the Province of Upper Canada in making surveys on the upper St. Lawrence. In 1834 Mills recommended that canal navigation should be established on the north shore of the St. Lawrence and submitted for the consideration of the commissioners three different schemes based on the dimensions adopted for the Cornwall Canal;[10] namely, 100 feet wide at bottom and locks 200 feet by 55 feet with 9 feet of water over the sills. He proposed short canals at the Cascades, Cedars and Coteau, using the St. Lawrence between the canals. According to this plan the whole length of the improvement would be 14⅝ miles, of which 7¾ would be by river and 6⅞ by canal; the whole descent would be 82½ feet of which 9½ feet would be overcome by the river and 73 feet by 9 locks of various lifts; the estimated cost of this first route was £235,782 ($943,128). Mills recommended this plan, using the river with short canals round the rapids.[11] His report was referred to a special committee of the House which approved it and recommended a grant of £240,000 ($960,000). It was afterwards brought up in Committee of the Whole from which it seems never to have emerged.

At the same time Alexander Stevenson presented a report to the legislature stating that he had made a survey of a connection between Lake St. Louis and Lake St. Francis by means of the St. Louis River, which empties into Lake St. Louis at Beauharnois connecting the head of the river with Hungry Bay on Lake St. Francis.[12] He found that the distance by this route was increased to 25 miles owing to the sinuosities of the river; that the total cost of the canal would be £62,557 ($250,228), and that it would afford a passage to boats drawing 5 feet of water.[13]

In1835 Messrs. Stevenson and Baird prepared two plans for a canal on the south side of the St. Lawrence.[14] One plan, like that of Stevenson's in 1834, proposed to follow the valley of the St. Louis River. The canal was to be 15¾ miles long, 100 feet wide at bottom and 140 feet wide at water surface; it was to have locks 200 feet by 55 feet and 9 feet depth of water on the sills. The estimated cost amounted to £194,800 ($779,200).[15] The other plan proposed an inland route 12 miles long, 100 feet wide at bottom and 140 feet wide at water surface. The estimated cost was £224,444 ($879,776).[16] Both these plans were submitted to the provincial legislature in 1835. However, with the exception of a survey of Lakes St. Louis and St. Francis made by Messrs. Thompson and Larue, nothing further seems to have been done by the Province of Lower Canada in connection with these works before the union.

In 1839 Phillpotts in his report reviewed the various lines proposed. He approved the original plan put forward by Mills of using the river between the rapids, with their short canals, and estimated that to construct them in a proper and substantial manner, with locks 200 feet long by 55 feet wide and 9 feet of water on the sills would cost £374,300 ($1,821,593).[17] Two years later the Board of Works submitted a memorandum stating that a sum of £255,900 ($1,023,000) would be required to construct a canal to avoid the Cascades, Cedars and Coteau rapids.[18] The estimate was based on the design made by Mills in 1834 for three short sections of canal on the north side of the river. However, on 17 February 1842, the chief engineer of the Board of Works reported that he had examined the various lines of canal proposed on both sides of the river, and that the inland route on the south shore which had been suggested by Stevenson in 1835 was a very judicious one and offered many advantages over the others.[19] He stated that the canal if built on the south shore would be shorter than if made on the north shore, and it would be above and independent of all water courses and that consequently it would not require any waste weirs; that it could be navigated two or three weeks longer every season than the one proposed for the north side; that the repairs and superintendence would be less, and that since the lock foundations would be chiefly rock, the cost would not be so great. The question as to whether the canal should be on the north or south shore of the St. Lawrence was now thoroughly discussed. Finally in the summer of 1842, the surveys and plans necessary to the construction of the canal on the route proposed by Stevenson were prepared by the engineer of the Board of Works, and in the autumn of that year contracts were entered into for its execution. Construction of the canal was completed before the close of navigation in 1845.[20] Dams at the upper end of the canal from the main shore to Grande Ile and thence to Ile-aux-Chats were commenced in May, 1849, and completed in June, 1850, at a cost of £5,695.17.3.[21] During the period 1852-54 regulating weirs were constructed at each of the locks, and in 1856 a dyke about 5 miles in length, intended to prevent the flooding of certain lands lying on the south shore of Lake St. Francis at the head of the Beauharnois Canal, was completed.[22] Yet from time to time residents on the banks of Lake St. Francis complained that the dams built at the head of the canal caused their lands to be flooded and, on various occasions, claimed and received compensation.

The distance from the head of the Beauharnois Canal through Lake St. Francis to the foot of the Cornwall Canal was 32¾ miles. This canal, extending from the town of Cornwall to the village of Dickinson's Landing 11½ miles further up the river, followed the northern shore of the St. Lawrence and overcame the Long Sault Rapids. We have already noted that its construction was the largest public work undertaken by the province of Upper Canada before the union. Work on the canal began in 1834. However, due to lack of money, the commissioners appointed to superintend the building of the canal were forced to suspend further work in 1838. The following year they reported that in the absence of any immediate prospect of the work being resumed, they had been compelled to discharge several officers connected with the engineer's department, retaining only the resident engineer and secretary.[23] Phillpotts in his report in 1839 estimated the cost of completing the Cornwall Canal at £57,300 ($228,860).[24]

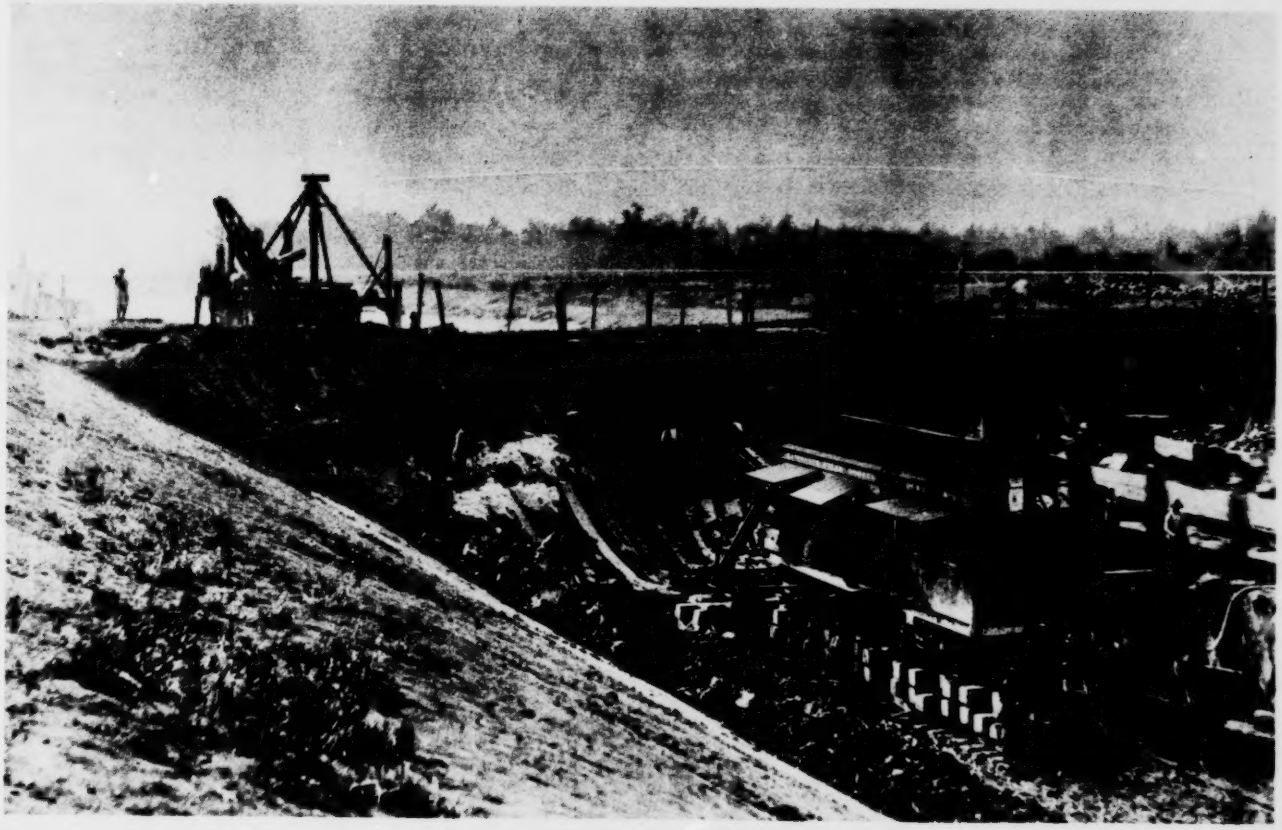
It was ascertained at the time of union, that the expenditure on the Cornwall Canal up to 31 December 1838 amounted to £354,203.2.1 ($1,416,812.41) and that a further sum of £57,617.6 ($320,685.20) was required to complete it.[25] At this time an additional sum of £5,215.15.6¼ ($20,863) was due in outstanding notes given by the commissioners to contractors.[26] It was further ascertained that, up to the day when the legislature of the Province of Canada first met in session, the total expenditure had been £362,134.11.10 ($1,448,538.37).[27]

Construction was resumed in 1842 under the direction of the Board of Works and in December of that year the steamboat *Highlander* passed through the canal. However, much work still remained to be done and the canal was not formally opened until June, 1843.[28] In 1860 the chief engineer of the Department of Public Works, acting on instructions, reported on the mitre sills of certain locks in the canal:[29] there was sometimes less than 9 feet of water. Thereupon the chief engineer submitted an estimate showing that the cost of deepening the canal to a depth of 10½ feet on the mitre sills and 11½ feet in the levels between them would be $250,000.[30] He expressed the opinion that if the works were placed in the hands of energetic contractors, they could be executed during the winter and spring without serious interruption to navigation.[31] However, with the exception of supply and regulating weirs at the head of the canal and at each of the locks, no works of importance were executed on the canal from the time of its completion in 1843 up to confederation in 1867.[32]

Next in ascending the St. Lawrence River came the three canals of Farran's Point, Rapide Plat and the Galops, usually known under the collective name of the Williamsburg canals. From the head of the Cornwall Canal to the foot of Farran's Point Canal the distance on the river was 5 miles. The canal, which lay on the north side of the river, extended from the foot to the head of the rapids at Farran's Point and was used principally by ascending vessels, since vessels descending did not enter the canal but ran the rapids with ease and safety. Construction of a canal at this point had been discussed and preliminary surveys were made prior to the commencement of the Cornwall Canal by the Province of Upper Canada. In 1833 Benjamin Wright reported that he had made a survey of the proposed canal.[33] Since it would only be used by ascending craft, Wright proposed that its breadth need only be 50 feet at bottom. He suggested that the dimensions of the lock should be 100 feet long and 55 feet wide and that it should have a 4-foot lift. Phillpotts in his report of 1839 estimated the cost of this work at £48,000 ($233,600).[34] Actual construction of the canal was not commenced until 1844 and was completed in October 1847. The breadth of the lock was fixed at 45 feet. The canal was three-fourths of a mile in length with a single lock 200 feet long by 45 feet wide, 9 feet of water on the mitre sills and a total lockage rise of 4 feet.[35] In 1860 the chief engineer of the Department of Public Works estimated the cost of deepening the canal 10½ feet on the mitre sills and 11½ feet in the reaches at $25,118.[36]

The distance from the head of Farran's Point Canal to the foot of the Rapide Plat Canal following the channel of the St. Lawrence was 10½ miles. Extending from Morrisburg to the head of the swift current and overcoming the Rapide Plat Rapids, this canal, located on the north shore, was used by ascending craft only as the descending vessels ran the rapids safely. From time to time three different lines had been proposed for this canal. The first by Samuel Clowes in 1826 commenced at a point near the mouth of Monk's Creek, then passing in the rear of Mariatown, followed Sawyer's Creek for about ½ mile to its mouth. In 1830 Barrett proposed a second line to run deeper or further inland than that proposed by Clowes. Three years later Messrs. Wright and Mills proposed a third line which followed the river's edge for a distance of 3-9/10 miles and had its upper terminus at the mouth of Sawyer's Creek.[37] Phillpott's report of 1839 approved the latter plan and estimated the cost of the works at £120,000 ($584,000).[38] However, nothing was done prior to the union. Finally, in 1843 surveys were made and construction was commenced in the spring of 1844. The length of the canal was 4 miles and it had two locks each 200 feet long by 45 feet wide with 9 feet of water on the mitre sills and a total lockage of 1½ feet.[39] In 1860 the chief engineer of the Department of Public Works reported on the cost of deepening the St. Lawrence canals so as to give 10½ feet of water on the mitre sills and 11½ feet of water in the reaches between the locks.

26 Construction of the Soulanges Canal, Quebec, 1895. The steam shovel is at the west end and the dredge at the east end of Section 9. (*Public Archives of Canada.*)



He estimated the cost of deepening the Rapide Plat Canal at $75,615.[40]

From the head of the Rapide Plat Canal to the foot of the Galops Canal the distance following the St. Lawrence was 4½ miles. The canal situated on the north bank of the river avoided the rapids at Pointe aux Iroquois, Point Cardinal and the Galops. Long before the union the Province of Upper Canada had seriously considered the construction of canals at these points. In 1833 Benjamin Wright, the engineer of the Cornwall Canal, surveyed these rapids and recommended two short canals.[41] One he located at the Galops to be 2,400 feet long with one lock of 4½ feet lift, and another at Point Cardinal to be 1,500 feet long with one lock of 2½ feet lift. However, nothing more was done for several years. Phillpotts approved of Wrights' plan and estimated the cost of the Galops at £29,500 ($143,566.67)[42] and the cost of Point Cardinal at £25,000 ($121,666.67).[43] In 1843 the Board of Works prepared a plan of canals for this section of the St. Lawrence navigation. One canal, designed to avoid the Iroquois Rapids, was 3 miles long with one lock 200 feet long by 45 feet wide and 6 feet lift.[44] From the head of this canal the ascending boats again entered the St. Lawrence and following its course upward for 2⅜ miles arrived at the foot of the Galops Canal made to overcome the Galops Rapids. This second canal, "The Galops," was 2¼ miles long with two locks each 200 feet long by 45 feet wide and 8 feet lift.[45] This plan of canals having been approved, it was carried into execution. Construction was commenced in 1844; the Galops Canal was opened in November, 1846, and the Iroquois Canal in September, 1847. Within a short time it was found that the Point Iroquois Canal lacked sufficient depth of water, a serious problem to vessels ascending the river. It was decided, therefore, to raise the water in the Iroquois by connecting it with the Galops.[46] The contract for the work was given out in the autumn of 1851 and was completed in 1856.[47] These canals then became known under the collective name of the Galops Canal. The length of the canal was 7⅝ miles and it contained 3 locks each 200 feet long by 45 feet wide with 9 feet of water on the mitre sills and a total rise of lockage of 15¾ feet.[48] In 1860 the chief engineer of the Department of Public Works estimated that the cost of deepening the canal so as to have 10½ feet of water on the sills and a 11½-foot depth between the locks would be $81,267 and that it could be executed without interruption to navigation.[49]

Before leaving the St. Lawrence canals a brief word might be said about the total cost of these works prior to confederation. This amounted to $7,569,586.50.[50] The sum included the following:

Outlays from the funds of the provincial government before the union	$1,846,942.52
Amount granted by the imperial government and spent before the union on the Lachine Canal	40,000.00
Expenditure through the Department of Public Works since the union	5,665,331.36
Payments made for land claims since the union by the former commissioners of the Cornwall Canal	17,312.62
Total up to 30 June 1867	**$7,569,586.50**

From the head of the Galops Canal, following the channel of the St. Lawrence and through Lake Ontario to Port Dalhousie at the foot of the Welland Canal, the distance is 236⅜ miles. The main line of this canal extends from Port Dalhousie on Lake Ontario to Port Colborne on Lake Erie. Following its completion in 1833 no work of any importance was done on the Welland Canal prior to the union in 1841. At that time the total government expenditure on the Welland Canal amounted to $1,851,427.77[51] and the canal was placed under the Board of Works. That body quickly decided that all the locks on the Welland should be rebuilt in stone and that their dimensions should be 120 feet long by 24 feet wide with 8½ feet of water on the sills. It was further decided that the aqueduct should be rebuilt in stone; that the feeder should be converted into a navigable canal; that the harbours at Port Dalhousie and Port Colborne should be improved; that the two first locks at Port Dalhousie and Port Colborne should be 200 feet by 45 feet with 9 feet of water on the sills. And finally, it was decided that the Port Maitland branch of the canal should be undertaken and completed with an entrance lock from Lake Erie 200 feet by 45 feet and 9 feet depth of water.[52] A sum of £450,000 ($2,190,000) was appropriated for these purposes.[53] Construction commenced in 1842. The following year it was decided after reconsideration to make the locks 150 feet long by 26½ feet broad and to widen the bed of the main line to 26 feet at the bottom. Enlargement of the main line to these dimensions from Port Dalhousie to the feeder and also of the feeder to Dunnville along with the construction of the Port Maitland branch was completed in 1845. The enlarged cut-stone locks were completed by 1848.[54]

Meantime the Grand River proved to be an unreliable source of water during the dry season. The Board of Works, therefore, decided in 1843 that the early project of adopting the level of Lake Erie as the highest level of the main line and of supplying the canal with water from the lake should be carried out.[55] The main line was opened to Lake Erie, through the feeder and the Port Maitland branch, in 1843. At the same time the section of the summit level situated between the mouth of the feeder and Port Colborne was emptied and excavated by hand. A contract was given in 1846 for deepening the "deep cut" section and widening the bottom to 45 feet.[56] Dredging was commenced in 1847 but the contract was suspended the following year by the mutual consent of the Department of Public Works and the contractors.[57] In 1850, though the "deep cut" was still unfinished, water was let into the section extending from the feeder to Port Colborne with the intention of completing its excavation by means of dredges.[58]

The demands of a heavy traffic forced the Department of Public Works in 1853 to decide to deepen the canal to 10 feet of water on the mitre sills and in 1854 to increase the bottom width of the summit level to 50 feet.[59] In the lower reaches of the canal the increased depth could only be obtained by excavation. Contracts were let in 1854 for the deepening and widening of the whole of the summit level to 50 feet at bottom by dredging, and the work went on continuously up to the time of confederation.[60]

In 1861 a guard gate was constructed above lock 25 on the Thorold level.[61] In 1859 the gates of this lock had been torn away by a steamer and the long reach above it had been emptied, thus causing much damage and a suspension of navigation for eight days. The guard gate on the Thorold level would prevent in future a recurrence of such delays as might arise from any similar accident.

During the period of 1841-67 the expenditure by the Department of Public Works on the construction of the Welland Canal was $4,900,820.60.[62] The total expenditure from government funds since the beginning of its construction up to 30 June 1867 was $7,416,019.83.[63] To this should be added the sum of $222,220 granted by the imperial government and expended before the union. The total cost of the Welland Canal by the time of confederation was $7,638,239.83.[64]

The Burlington Bay Canal may be considered a branch of the main line of the St. Lawrence navigation. It was a half-mile long cutting with no locks through a piece of low land which partly separated Lake Ontario from a large sheet of deep water called Burlington Bay. This canal enabled vessels to reach both the city of Hamilton and the Desjardins Canal[65] leading to the town of Dundas. Burlington Bay, lying at the upper end of Lake Ontario, was almost entirely separated from the latter by a sand bar 6 miles long and 300 feet wide. It contained several good landing places and the importance of opening a navigable channel through it to Lake Ontario became apparent at an early date.

On 19 March 1823, a Bill was passed in the Upper Canada legislature authorizing the construction of a navigable canal between Burlington Bay and Lake Ontario.[66] Commissioners were appointed to carry out the construction of this canal, and in 1825 they reported that they had received the services of Mr. Hall as engineer and had entered into contracts with a firm of contractors who agreed to complete the work by 1 October 1825, for the sum of $34,000.[67] Unfortunately difficulties arose between the contractors and the commissioners. This retarded the progress of the works which were not completed until 1832. From then until the union in 1841, the works appear to have been extended gradually every year and the channel to have been deepened. The amount expended on this canal up to 1841 was £31,089.0.5 ($124,356.08).[68]

After the union the canal was placed under the care of the Board of Works whose chairman reported that this canal was in a ruinous and dilapidated condition. In 1843 the board commenced some improvements here which were finished in 1850.[69] These works consisted of the deepening, straightening and widening of the artificial channel then in use; the lining of the sides of the channel with cribwork filled with stone, and the establishment of a ferry over the channel. In 1855 the outer end of the south pier was extended 300 feet into Lake Ontario, and the river end of the south pier was extended 50 feet into the bay.[70] The expenditure by the Department of Public Works on the construction of the Burlington Bay Canal from the union in 1841 up to confederation was $291,044.49.[71] The total cost of the canal from the time of its commencement in 1825 to 1 July 1867, was $432,684.40.[72]

Toward the end of the 18th century a small canal with a wooden lock was built by the North West Company to overcome the falls and rapids in the St. Marys River, connecting Lakes Superior and Huron, and thereby ease the passage of their *batteaux* through this area. The survey for this canal was made in 1797 and the canal which resulted was about one-half mile long and was provided with a lock 38 feet long, 8 feet 9 inches wide with a lift of 9 feet. In 1799 the North West Company applied for a grant of land at Sault Ste. Marie for a trading post, an application opposed by Messrs. Phyn Inglis & Co. the London agents for the rival XY Company. Writing on 13 March 1800 to the lieutenant governor of Upper Canada, the Duke of Portland agreed with Messrs. Phyn Inglis & Company that the possession by the North West Company of a tract of land on the Falls of St. Mary would be injurious to others engaged in the fur trade. His Grace stated, "I am strongly inclined to be of opinion that it must be very much for the benefit of the fur trade, that about four or five leagues or perhaps the whole of the strait in question, should be retained in the hands of the Crown."[73]

By 1802 the disputes between the North West and XY companies were increasing in virulence. In April of that year Messrs. McTavish & Company, on behalf of the North West Company, applied for the sole use of the improvements on the north side of Sault Ste. Marie. A quotation from their memorial will show what these improvements were. The company mentioned the efforts it had made to render the Indian trade free and independent of the American government by exploring and opening communications with the interior country through British territory. It then went on to say:

> *That in furtherance of the same view and contemplating the advantages of a free and unobstructed passage between Lakes Huron and Superior, your memorialists, in the year 1797, caused a proper survey to be made on the British side of the Falls of St. Mary; the sixth part of the expense of which, amounting to about forty-five pounds, was defrayed by the House of Messrs. Forsyth, Richardson & Co. That in consequence of the report made by the said survey, your memorialists have since that period, actually cut a road forty-five feet wide across the carrying place, and opened a canal, upwards of three thousand feet in length, with a lock which raises the water nine feet, and also erected thereon a saw-mill, storehouses and other necessary buildings for facilitating the navigation of said canal.*[74]

The company followed this résumé with an account of the efforts it had made to secure communication by purchasing land from the Indians; by improvements at Kaministikwia, and the great cost of the canal, increased by annual interest and the charges for maintenance and salaries. The canal yielded no revenue but was merely intended for facilitating the transport between the lakes, entitling it, the company believed, to the sole use of all its improvements. It represented further:

> *That if Your Excellency should order the navigation of aforesaid canal at the Falls of St. Mary to be laid open, Your Excellency will be pleased to take into consideration the great expense of that establishment, and allow an adequate toll on the property that shall be carried through the said canal, sufficient to indemnify your memorialists for a great proportion of the said expense and also proportionate to the benefit to be derived from the ease and security of the said navigation, until which period your memorialist must consider the said canal a private property and will prevent all others benefitting by it.*[75]

A counter memorial was now signed 15 April 1802, by Messrs. Forsyth, Richardson & Company and by Messrs. Parker, Gerard, Ogilvy & Company at Montreal. This memorial speaks of the canal constructed by the North West Company as "a species of canal or dam, on the lower of which they (the North West Company) have erected a saw mill and which canal or dam facilitates the conveyance of merchandise in furs between the said lakes."[76] These companies insisted on their right to make use of it on payment of a reasonable compensation and asked that a competent officer be sent to make a survey and report on the said canal or dam.

On 26 July 1814, Gabriel Franchère arrived at the east end of Michipicoten Bay where he met Captain McCargo and the crew of one of the schooners of the North West Company who had escaped from Sault Ste. Marie. The Americans had attacked that post, pillaged it of every valuable article belonging to the company, and then set fire to all the houses, stores and sheds. On 30 July, Franchère, McGillivray and others went to Sault Ste. Marie where they found the ruins of the buildings, including the sawmill and the schooner driven down to the foot of the rapid where she burned to the water's edge.

Following the amalgamation of the North West and Hudson's Bay companies in 1821, new buildings were erected at the Sault. On 1 March 1824, Thomas Thain, agent for the Hudson's Bay Company in Canada, wrote to Colonel Darling, the military secretary, offering "to enter into such arrangements for the sale of the buildings at present occupied by the servants of the company at St. Mary's as may suit the view of His Excellency."[77] In the course of the negotiations a plan of the buildings was sent which shows the canal but not the lock; there is marked, however, a race to the saw-mill which it is stated on the plan was built in 1821.[78]

In 1851 two petitions were presented to the Canadian legislature relative to the construction of a canal on the same side; one on behalf of Angus D. Macdonell[79] of Toronto, the other from Frederick Capreol.[80] Macdonell asked for an Act of Incorporation for the construction of a ship canal around the Sault. Capreol asked for a charter to be granted to him under certain stipulations for a canal at the Sault to connect Lakes Superior and Huron. A bill to incorporate the Sault Ste. Marie Canal Company represented by Macdonell was introduced in the legislature and passed second reading.[81] During the third reading on 22 July 1851, however, Francis Hincks moved its rejection which was seconded by Louis Lafontaine and carried.

The following year Macdonell presented another petition for a charter. By this time, however, the state of Michigan had begun a canal on the American side which was completed in 1855. Nothing further was done in this matter by the Canadians until several years after confederation.

ii

As already indicated, a second line of navigation extended from Montreal to Kingston via Ottawa, a distance of 246½ miles. After leaving the Lachine, the canals on this route were Ste. Anne (known as the Ste. Anne Lock), Carillon, Chute-à-Blondeau, Grenville and Rideau. Their united length was 142⅞ miles, including the Lachine, and in going from Montreal to Kingston the total lockage was 518¼ feet; that is, 401¼ rise and 177 feet fall, during seasons of high water. As mentioned previously the Carillon, Chute-à-Blondeau, Grenville and Rideau were designed as military works. In the decade preceding the union, designs were prepared for the construction of a canal and lock as would overcome the rapids at Ste. Anne, and the legislature of Lower Canada as early as 1831 made an appropriation for the construction of such works.[82] Finally in August, 1839, the Board of Works of Lower Canada appointed an engineer to make the necessary surveys and plans.[83] Tenders for the work were received in the autumn of 1839 but, owing to a prolonged discussion relating to the effect of the proposed work on the level of the waters of the Lake of Two Mountains as well as the question whether Ste. Anne was the best site for the lock, the contract for the works was not signed until 18 May 1840.[84]

At the time of union this work was among those transferred to the Province of Canada, only $19,860.02 having been spent on its construction up to that time.[85] The lock was completed on 22 June 1843, and the first boats passed through on the twenty-sixth. On 14 November the works were announced as complete. The canal was ⅛-mile long with one lock 190 feet by 45 feet with 6 feet depth of water on the sills at low water and 7 feet at ordinary high water.[86] The total rise of lockage was 3 feet. In 1849 two piers were erected below the lock to guide vessels through the channel while in 1855 a pier extending 150 feet above the lock was commenced and finished the following year.[87] During the period 1856-58 rock was cleared from the channel. The expenditure on this canal from the time of union up to 30 June 1867 was $114,596.49.[88]

We already know that the ordnance or military canals (Carillon, Chute-à-Blondeau, Grenville and Rideau) were constructed by the imperial government and were managed by imperial authority. On 24 March 1848, however, the imperial government proposed to transfer these canals to the care of the Province of Canada and to confide the management of them to a board composed of civil and military officers.[89] At the time, financial consideration did not permit the province to accept the proposed transfer as it was feared that the cost of management and repairs of the works would exceed the revenue to be derived from them. On 3 March 1853, the imperial government made a second proposition to the province whereby the canals would be transferred to Canada and the cost of maintenance and management defrayed by the imperial government up to 30 September 1853.[90] Pending settlement of the question, the Canadian government by order in council of 13 May 1853, resolved to pay the expenses and management of these works from 1 October 1853.[91] The conditions upon which the ordinance property was to be transferred were stated in a third dispatch of 14 July 1853.[92] By an order in council of 14 September 1853, the Canadian government accepted the proposed conditions but demanded the absolute control and management of the canals and lands to be transferred with the same.[93] The imperial government agreed to this proposal in 1855, whereupon an Act was passed by the Canadian government on 30 May 1855,[94] authorizing the governor general to accept the transfer by an order in council which was passed on 25 January 1856, and was ratified by an Act of the Canadian Parliament (19 Vic., C.115) on 19 June 1856.[95] These canals were then placed under the control of the Department of Public Works by an order in council dated 3 March 1857. They were maintained at the expense of the province from 1 October 1853 to 30 June 1867, at a cost of $617,116.15 inclusive of $3,146.58 for the Rideau survey.[96]

iii

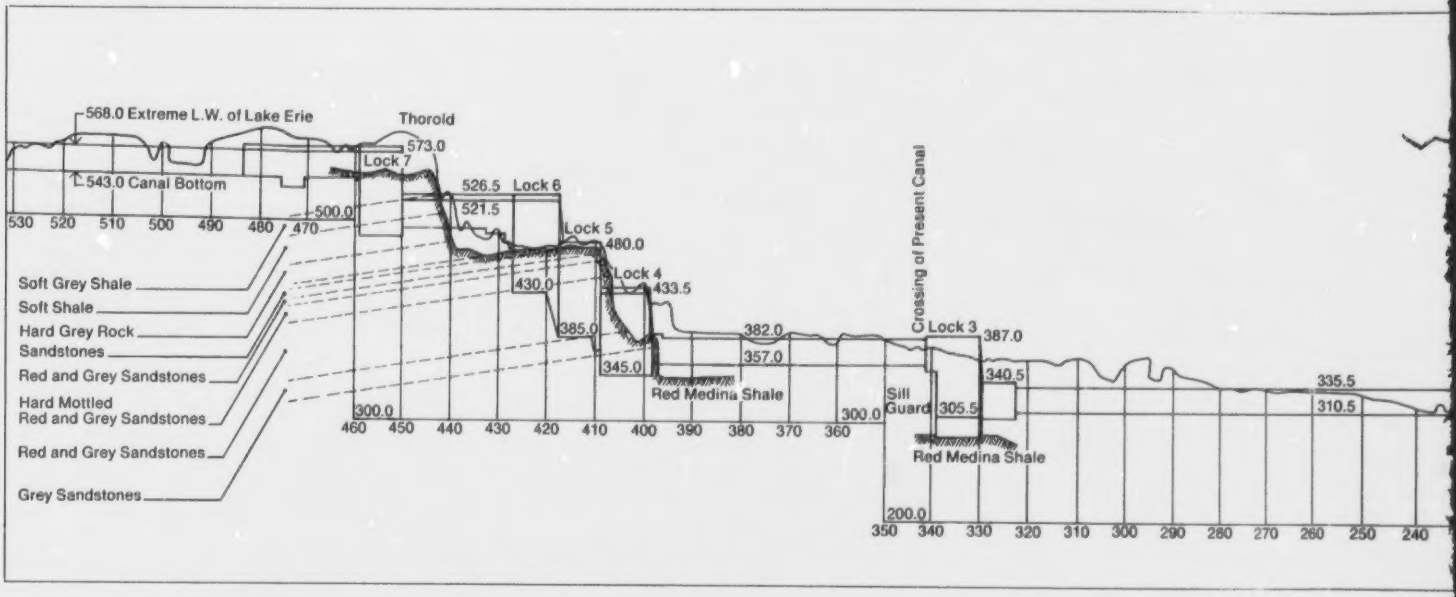
The Richelieu River and Lake Champlain route formed the third line of improved inland navigation. It was designed to place the St. Lawrence River in communication with Lake Champlain and the American system of canals which led to the Hudson River and New York City. The lock and dam at St. Ours, which was 14 miles above the mouth of the Richelieu, retained the water of the river and gave a depth of not less than 7 feet as far as the lower entrance to the Chambly Canal. The need of opening a slack water communication between the St. Lawrence and Lake Champlain was freely discussed in the years immediately following the close of the War of 1812. Accordingly a Bill was passed in 1818 by the legislature of Lower Canada granting to a company the right of forming a canal so as to connect the navigation of the lake with the basin at Chambly and avoid the Chambly Rapids.[97] This basin was an expansion of the Richelieu River; it had deep water, and on the western side of it was situated the village of Chambly, where also was located the entrance of the canal, at a distance of about 46 miles from the mouth of the river. The Act passed by the legislature prescribed that the locks should not be less than 20 feet in breadth, and of a depth sufficient to admit vessels drawing 5 feet of water. The capital of the company was limited to £45,000 ($180,000) and the term within which the canal was to be completed was limited to seven years. The company ordered the necessary surveys and prepared three designs, with their different dimensions for a canal with its locks, and in 1821 submitted to the legislature that the cost of even the smallest of these canals would far exceed the capital authorized to be raised for the purpose. The company therefore asked for authority to increase the capital. The matter was thoroughly considered by a committee of the legislature which reported that the breadth of the locks should not be less than 30 feet with 5 feet depth of water. The committee expressed the opinion that the civil and military authorities should be empowered to take up such shares or portion of shares of the canal as might be left unsold and that a fund should be appropriated for that purpose.[98]

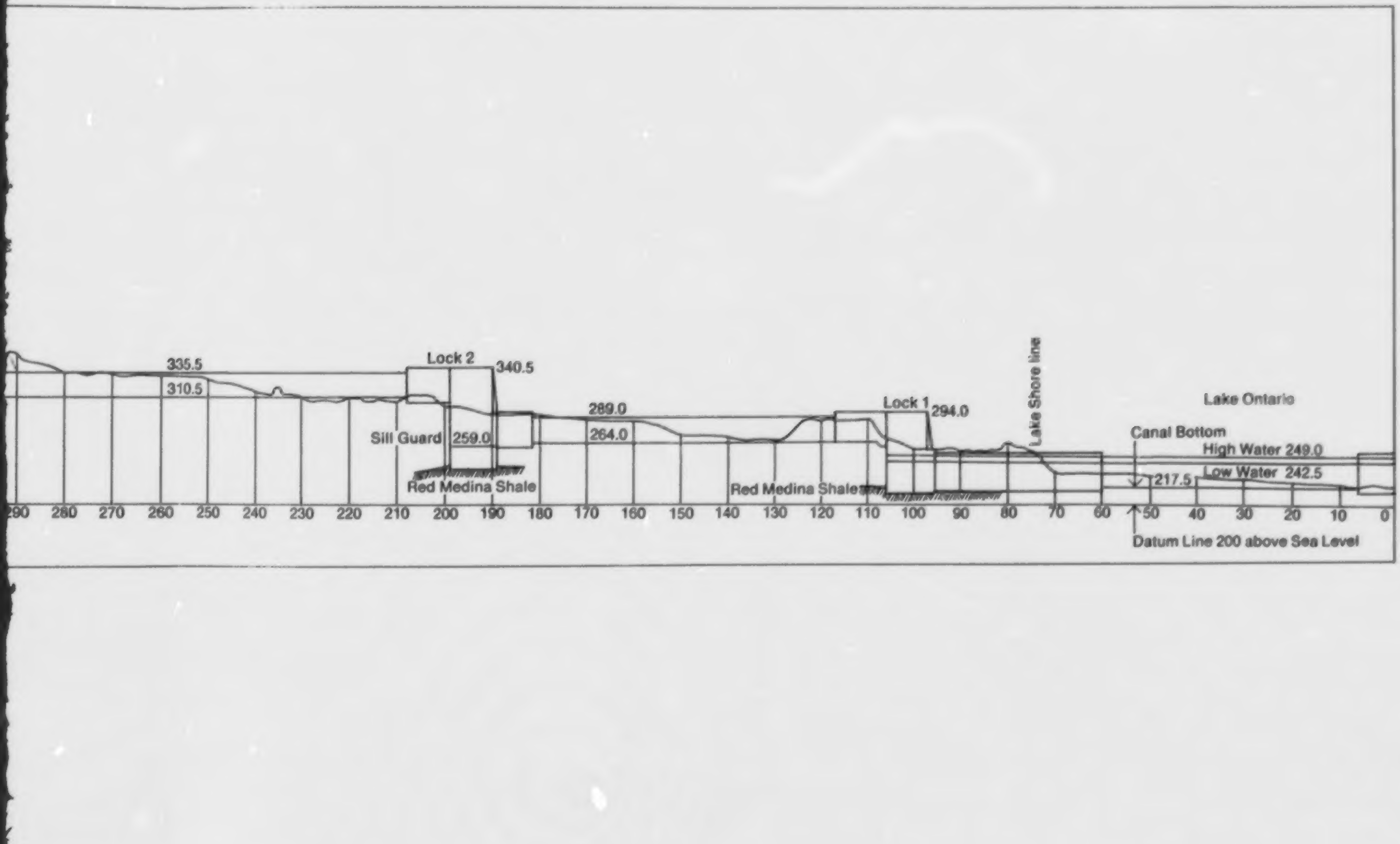
In 1823 the works had not yet been commenced and it became evident that the company would forfeit its rights under the clause in their Act which prescribed that the canal should be completed within seven years. A new Act was therefore passed appropriating £50,000 ($200,000) for the construction of the canal.[99] The Act fixed the breadth of the locks at 20 feet with a depth of 5 feet. It provided for the appointment of a commission and stipulated that the works should not be commenced until after the completion of the Lachine Canal. The delays were a source of disappointment to the merchants of Quebec and were the cause of a petition to the legislature in 1826 praying that the canal might be commenced immediately.[100] Yet nothing was done in the matter until 1829 when the commissioners were appointed in conformity with the Act.[101] These commissioners were charged with the management both of the works at St. Ours and those of the Chambly Canal. Following their appointment the commissioners ordered an examination of the river by Mr. Fleming, civil engineer, who informed them that there were two modes of improving it: first, by raising the water by means of a dam; and second, by dredging its bed. Fleming advised the latter plan and the commissioners adopted it.[102]

For two years (1830-31) the commissioners continued to employ men by the day in raising the boulders and large stones from the bed of the river. The original appropriation of the legislature for the works was £7,950 ($31,800).[103] By the end of 1831 there was still a balance of this sum unexpended amounting to £4,000 ($16,000). However, nothing further was attempted until after the appointment of Mr. Hoskins in March, 1835, as the engineer of the Chambly Canal. He advised the abandonment of the project of deepening the river and recommended the construction of a dam, with a cut-stone lock.[104] The commissioners approved Hoskins' suggestion, secured tenders, entered into a provisional contract for the execution of the work, and applied to the legislature for an additional grant. A bill authorizing an appropriation of £9,500 ($38,000) in addition to the unexpended balance of £4,000 ($16,000) passed the legislature.[105] And there for a time the matter rested. In 1840, however, the commissioners were authorized to borrow a sum of £35,000 ($140,000)[106] and the works were fully resumed; but owing to difficulties with the contractors very little progress was made during the year.

After the union of the provinces, the Board of Works ordered new surveys to be made. At the same time the board approved the plan of a lock and dam at St. Ours but selected a different location from that proposed by Hoskins. The works were finally commenced in 1844 and after some interruption in 1846, from the failure of the first contracts, they were completed in the middle of September 1849. The canal was ⅛-mile long and had one lock 200 feet long by 45 feet wide with a depth of 7 feet of water on the sills and a total

27 Profile of lock sections of the Welland Ship Canal.
(*Sessional Paper* No. 20, 1914.)




335.5
310.5
Lock 2
340.5
Sill Guard
259.0
Red Medina Shale
289.0
264.0
Lock 1
294.0
Red Medina Shale
Lake Shore line
Lake Ontario
Canal Bottom
High Water 249.0
Low Water 242.5
217.5
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
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20
10
0
Datum Line 200 above Sea Level

28 The Canadian Atlantic Railway barge *Cherokee of Kingston* in the Soulanges Canal. (*Public Archives of Canada.*)

rise of lockage of 5 feet. In the spring of 1849 high waters overflowed the coping of the locks. However, this difficulty was overcome by raising the lock walls 5 feet higher in 1851. During the period 1841-67 expenditure on the construction of this work was $121,537.65.[107]

In 1841 immediate steps were taken to complete the Chambly Canal and in the spring of 1843 it was opened throughout. However, the works were found to have been executed in a very imperfect manner. The side walls of the lock were too thin and of poor material; the excavation was irregular in shape and not of sufficient depth. The irregularities in excavation were remedied in 1850 and repairs to the locks were completed in 1858.[108] The canal was 12 miles long and contained 9 locks which differed in dimensions from 124 feet to 118 feet in length, but with a regular width of 23 feet. Depth of water on the sills was 7 feet and the total rise of lockage was 74 feet.[109] Expenditure on the canal from 1841 to 30 June 1867 was $69,758.01.[110] The total cost of the works at St. Ours and Chambly from commencement to 30 June 1867, was $756,249.41 of which $634,711.76 was expended on Chambly and $121,537.65 on St. Ours.[111]

iv

Early in the history of Upper Canada, consideration was given to the opening of a line of navigation known as the Trent River navigation. This line ran between Lake Ontario and Lake Huron by means of the Trent River and the rivers and lakes of the Newcastle District so as to afford accommodation to the local traffic and shorten the distance by water between Lake Ontario and the Far West. In 1827 the legislature received from a number of settlers a petition relative to the navigation of the waters of the Newcastle District, whereupon a committee of the assembly was formed and reported that it was "exceedingly desirable and important that those waters which constitute the chain of lakes and rivers which run on a south-easterly direction from the vicinity of Lake Simcoe and which empty into the Bay of Quinte, by the River Trent, should be examined and surveyed by competent persons, with a view to ascertain how far they might be rendered navigable, and the probable expense attending the same."[112] Nothing, however, appears to have been done before February, 1833, when a bill was passed appointing commissioners to receive plans and to execute the works necessary to the improvement of the inland waters of the Newcastle District, commencing at the mouth of the Otonabee River, which discharges into Rice Lake, and extending to Lake Scugog.[113] The commissioners obtained a design for a short canal at Bobcaygeon with a wooden lock. It was commenced in 1835. The length of the canal was 973 feet and the lock was 119½ feet long by 28 feet wide with 4¾ feet of water on the sills at low water and 7¼ feet at high water.[114] The lock permitted vessels on Lakes Chemong, Buckhorn and Pigeon, which are on the same level, to ascend into Sturgeon Lake, and thence up the Scugog River as far as Lindsay.

The small wooden lock at Bobcaygeon was considered only a temporary expedient. It seems to have been well understood that larger and more permanent works in a comprehensive plan extending from Lake Ontario to Lake Huron would be eventually undertaken. In 1833 the lieutenant governor of Upper Canada instructed N. H. Baird to make a survey of the section extending from the mouth of the Trent to Rice Lake and to estimate the cost of rendering these waters navigable for vessels drawing 5 feet, the locks to be 134 feet long by 33 feet wide. In November of the same year Baird reported that there were several obstructions to navigation between the mouth of the Trent and the foot of Rice Lake.[115] The obstructions were Nine Mile Rapids (where it was proposed to construct a lock); rapids and falls between Percy Landing and Crow Bay (proposed to construct 14 locks); Heely's Falls (proposed to construct 8 locks), and Crooks' Rapids (proposed to construct one lock). This formed a total of 37 locks with 18 dams and 4¾ miles of side cuts, the locks to be of stone, and the estimated cost of the public works was £233,447.6s.11½d.[116]

In 1835, Lieutenant Governor Sir John Colborne, in compliance with an address from the assembly, appointed Baird "to examine the most eligible route for a canal between Rice Lake and Lake Simcoe" (i.e., the second section of the line). Instead of cutting a canal through the whole distance, Baird advised the formation of a canal 13¾ miles in length from the Talbot River section; for the remainder of the line he recommended the damming of the river so as to establish a succession of still-water reaches connecting by means of locks. Baird proposed to leave Rice Lake, ascend the Otonabee, Clear, Buckhorn, Chemong, Pigeon, Sturgeon, and Cameron lakes and Balsam Lake, which is the summit. Then he descended into Lake Simcoe by means of a canal and about 2¾ miles of the River Talbot. The distance from River Lake to Lake Simcoe was 109½ miles.[117] Baird divided the works into five sections:

Rice Lake to Peterborough	21-22/80 miles
Peterborough to Clear Lake	14-24/80 miles
Clear Lake to Bobcaygeon	31-40/80 miles
Bobcaygeon to Balsam Lake	26-24/80 miles
Balsam Lake to Lake Simcoe	16-40/80 miles

	Rise in Feet	Dams Required	No. of Locks
Rice Lake to Peterborough	4½	2	1
Peterborough to Clear Lake	147½	6	14
Clear Lake to Bobcaygeon	38⅛	2	5
Bobcaygeon to Balsam Lake	34	3	5
Balsam Lake to Lake Simcoe	118½	(fall)—	12
Total		**13**	**37**

The total length of canal required on these five sub-divisions was about 17 miles. Proposing stone locks 134 feet by 33 feet with 5 feet of water on the sills, Baird estimated the cost of the whole at £262,067.16.4. Baird's estimate therefore for a line of navigation from the mouth of the Trent (in Bay of Quinte) to Lake Simcoe was £233,447.6.11½ (from the mouth of Trent to Rice Lake) and £262,067.11.4 (from Rice Lake to Lake Simcoe), totalling £495,515.3.3½.[118] The two divisions of the Trent navigation were therefore, (1) Trent River and (2) inland or back waters of the Newcastle District.

At a public meeting of the inhabitants of the townships of Fenelon, Verulam and Neighbourhood (held at Fenelon Falls on 24 September 1836 for the purpose of considering what measures should be adopted by them for assisting the work of opening the navigation of the Trent River), the following resolutions were adopted:

1. That the opening of the navigation from Lake Huron down to the Bay of Quinte by way of Lake Simcoe, the Trent River and intermediate chain of waters, would be the work of utmost importance in a national point of view, as connecting the extreme parts of Upper Canada by the best, nearest and cheapest internal communication, and thereby opening up the interior of the country, and concentrating her powers and energies.

2. In a military point of view it is almost essential to the proper defence of the country as affording in time of war a safe and easy communication remote from the frontier to the most distant parts of the province.

3. In a mercantile point of view the benefits to the country would be innumerable:– It would divert a great part of the carrying trade of the Western States to Upper Canada and thence either across to Oswego or down the St. Lawrence, from the present circuitous route through the United States. The whole line of Canal being also thro' one of the richest tracts of country which at present is almost shut out from every market, it would be a great stimulus to agriculture and commerce throughout the internal parts of the province. It would also be the means of opening up to Canada a new and extensive country for lumber which would be most conveniently situated for export either to the United States or English markets. It would also open to the country extensive and valuable iron mines, particularly the Marmora iron works, which are not valuable now for want of an outlet to market.

4. That the Bill which passed both houses of Legislature last session of Parliament for granting £16,000 to improve the navigation from Buckhorn Rapids through Chemong Lake, Pigeon Lake and Sturgeon Lake to the head of Scugog Lake, as also from Rice Lake to Peterboro would be of the greatest benefit to an extensive back country as affording a comparative relief until the Trent is opened, to their present distressed state from want of an outlet to Lake Ontario for their produce.[119]

In 1836 the legislature of Upper Canada passed an Act authorizing a loan of £16,000[120] to be applied to the construction of works on the inland waters. In 1837 a loan of £77,507[121] was authorized to be appropriated to the Trent River works. In 1839 a further loan of £3,000[122] was authorized to be applied to the inland division, thus forming with the previous appropriation a sum of £19,000 for the inland or back water section. Meanwhile, two boards of commissioners were appointed by the lieutenant governor – one for each division – as provided by the Acts,[123] and under the auspices of the commissioners the works were begun in 1837 with N. F. Baird as engineer. On the commencement of the works the receiver general laid aside the sum of £28,000 which had been provided by the sale of debentures to be applied to the works on the Trent River division. Since the value of the works under contract along with the proposed dam at the head of the Nine Mile Rapids, together with contingencies and engineering expenses, did not amount to more than £25,000, the funds provided were sufficient. However, during a period of tight money in 1838-39 the sums earmarked for the commissioners were applied to other purposes. Therefore up to the end of 1841 when the commissioners gave up their charge, the total amount in their hands for the works was only £20,935.[124] Lack of funds was a continual source of embarrassment to the commissioners, and early in 1839 the contractors suspended operations. The total expenditure prior to the union on the two divisions was £44,398.[125]

In a memorandum to His Excellency the Governor General dated 12 August 1841,[126] the chairman of the Board of Works reported that the original intention was that this line of navigation would establish a through line of communication to accommodate the through trade between the western states and the seaboard and also the local traffic of the counties traversed. The chairman maintained that as a through line the navigation would not be successful owing to the great lockage required and the limited draft of water of the vessels which could be used on this route. In regard to local traffic he maintained that the route through the greater part was extremely circuitous. He stated further that the probable cost of the works, when completed, would be from £800,000 to £900,000 and that the scheme of forming a through line should be abandoned. He suggested, instead, that the locks which had been commenced should be finished and that slides to facilitate the descent of timber should be made. The chairman asked for an appropriation of £50,000 from the legislature to be applied to these works. His Excellency approved of these suggestions and the following works were authorized and executed before confederation.[127] A dam erected at the head of Nine Mile Creek in 1844. The same year saw the completion of the unfinished lock and slide at Chisholm's Rapids. Piers and booms were constructed and placed on Percy Landing in 1844, while at Ranney's Falls a dam was built and a slide 1,492 feet long was completed in 1845 along with necessary guide booms. At Campbellford guide booms were positioned in 1844 and a bridge was built the same year. A cross dam of some 12 feet length and a swing bridge were built at Fidlers Island in 1848, while at Crow Bay a retaining boom 2,600 feet long was positioned and maintained. A dam and two slides were built at Heely's Falls in 1844 while at Crooks' Rapids a dam was built in 1835 and the lock and canal in 1844. The following year a timber slide was constructed and a bridge 485 feet long was made over the river below the dam with a swing bridge over the lock. At Whitlas' Rapids the lock, dam and canal, commenced before the union, were finished in 1848 and three piers and one boom were placed at Little Lake in 1852. A dam had been built at Buckhorn prior to the union while a slide with 2 feet draught of water with booms was made for the station. In 1857 the wooden lock was replaced by a stone one and in 1858 two slides were built and a basin and two mill-races excavated. Three sections of bridges were built over branches of the river opposite the lock in 1845 and were later placed in charge of the local township municipalities. A swing bridge connecting with this line of bridges was placed over the locks in 1858. At Lindsay (formerly Purdy's Mills) the wooden lock, commenced prior to the union, was completed in 1844. The lock was converted into a slide in 1859 and a bridge comprising three spans on cut-stone abutments and piers was opened in 1864.

Acting on a request made by the legislature and under the orders of the commissioner of Public Works, the chief engineer of that department caused an examination of the Trent River to be made between the Bay of Quinte and Rice Lake. This report, dated 22 April 1846,[128] reviewed the plan proposed by Baird in 1833, a plan which called for the building of dams across the river at various points in its most rapid sections. This would form the river into a series of still-water reaches to be connected by means of locks. The chief engineer objected to this scheme believing that dams would interfere with the passage of timber, that they were not durable and were liable to be damaged by floods. He suggested instead the forming of three sections of canal, the first extending from near the mouth of the Trent to the head of the Nine Mile Rapids; the second from Percy Landing to the foot of Crow Bay, and the third, from Crow Bay to the head of nection with the completed locks at Heely's Falls. These three canals in con- Chisholm's and Crooks' Rapids would have opened a line of navigation from the Bay of Quinte to Peterborough and the Otonabee. The entire length of canal required in the three sections proposed was 18¼ miles requiring 29 locks. The chief engineer estimated the probable cost of the works (if executed on the scale adopted for the locks at Chisholm's and Crooks' Rapids) would be about £400,000 currency.

In 1855 the commissioner of Public Works stated that the cost of maintaining the slides and booms connected with the descent of timber on the Trent was greater than the revenues they produced. The commissioner recommended, therefore, that the slides and booms should be placed in charge of a committee or company of persons interested in the lumber trade on the Trent who had offered to assume their management.[129] This recommendation was accepted by the government. Works connected with navigation, such as locks and lock-houses, remained under the direct control of the Department of Public Works. Works connected with the descent of timber at Chisholm's Rapids, Ranney's Falls, Middle Falls, Heely's Falls and Crooks' Rapids were handed over to the care of the company. It was authorized to levy tolls on timber descending the river. However, tolls were levied only at Ranney's Falls, Middle Falls and Heely's Falls where the works had been constructed expressly for the safe descent of timber. Previous to December, 1866, the rate of toll was one dollar per crib for each of the three slides. On 8 December 1866, however, an order in council was passed fixing the rate of toll payable at each of the three stations named above at one cent for each log 13 feet in length and a proportionate sum in pieces of greater length, and one dollar for each crib of square timber. The expenditure by the department on these improvements since the union in 1841 up to 30 June 1867 was $492,486.31.[130] The total cost of construction on these works since commencement up to 30 June 1867 amounted to $670,078.31, subscribed as follows:[131]

On canals prior to the union	$ 92,449.33
Slides prior to the union	85,142.67
On canals since the union	216,921.98
Slides since the union	228,347.05
Roads since the union	30,454.40
Bridges since the union	16,762.88
	$670,078.31

V

A projected canal between the St. Lawrence and Lake Champlain, referred to as the Caughnawaga Canal, was first broached in 1847 when Messrs. John Young, Luther Holton, and other leading merchants of Montreal memorialized the governor general, Lord Elgin, stating that it was their intention to apply to the legislature for a charter to construct a canal to connect the St. Lawrence with Lake Champlain near St. John.[132] They requested that in the meantime the government order a survey of the whole proposed work. Their object in pressing for construction of this canal was to open a cheap line of water communication between Canada and the eastern states. It was expected that this canal would lead to the extension of Canadian trade and would become, in connection with the St. Lawrence, the highway for produce from the West to the eastern states. Elgin acceded to the prayer of the memorialists and J. B. Mills, civil engineer, was instructed to make the required survey. This he did and on 19 February 1848, reported[133]

That in his opinion the upper terminus of the canal should be at St. John, the present head of the Chambly Canal, and that although the River Richelieu from St. John to Lake Champlain, a distance of 21 miles was not sufficiently deep in its whole length, it could be easily made so, at a trifling expense. If the projected site of the terminus on the St. Lawrence was at a point on the St. Lawrence above the Lachine Canal the total lockage would only be the absolute difference of level between Lake Champlain and the St. Lawrence above the Lachine Canal, namely 29 feet.

Mills suggested that in forming the canal between St. John and Caughnawaga, the present Chambly Canal should be enlarged from St. John for 8⅞ miles toward Chambly and then, following the low lands so as to allow the new canal to be supplied with water from Lake Champlain, to descend by three locks into the St. Lawrence at or near Caughnawaga. The length of the canal, including the 8⅞ miles of enlarged Chambly, would be 32½ miles, and Mills proposed that the locks should be 200 feet x 45 feet with 9 feet of water on the sills. The cost of the proposed work was estimated at £453,602 ($1,814,408).[134]

In 1852 the commissioner of Public Works urged the construction of the canal. Two years later, J. B. Jarvis, civil engineer, was instructed to report on the projected work both from an engineering and a commercial point of view. His report of 13 February 1855 reviewed the commercial relations between the United States and Canada and considered the means of transport at the command of the Americans compared with the St. Lawrence and the Canadian canals. Jarvis concluded his report by advising the construction of the canal and suggested one with entrances at Caughnawaga and St. John, the latter to be the terminus on Lake Champlain. He projected a summit level 37½ feet above Lake Champlain to be supplied with water from the Beauharnois Canal through a navigable feeder. He called for locks of cut-stone 230 feet in length by 36 feet in breadth and of sufficient depth to admit vessels drawing 10 feet of water. Jarvis estimated the cost of this work at $4,267,890.[135]

In 1855, S. Gamble, civil engineer, acting under instructions from the Department of Public Works, reviewed the conclusions arrived at by Messrs. Jarvis and Mills and advised the adoption of the Lake Champlain level as first suggested by Mills; that is, enlarging 8⅞ miles of the Chambly Canal and following the low lands so as not to require a summit reach. He further recommended that the locks should be made 45 feet wide as on the St. Lawrence canals instead of 36 feet as recommended by Jarvis.[136] In the same year still another civil engineer, W. H. Swift of Boston, was consulted and he too recommended in a report dated 6 June 1866 the line proposed by Mills.[137] Finally, in January of the following year, Gamble reported that after examining the terrain between Lake Champlain and Lake St. Francis above the Beauharnois Canal he found that its formation was not favourable to the construction of a canal.[138] Following this pessimistic report no further departmental action was taken on this subject.

vi

One of the most pretentious of the projected Canadian canals was that proposed for connecting the St. Lawrence River and Georgian Bay.[139] It was suggested that an important line of navigation could be opened between Canadian seaports and the western lakes by improving the Ottawa and French rivers. A glance at the map of Canada showed that a vessel going from Montreal to the far west, by the St. Lawrence and the lakes, made a straight southwest line to the head of Lake Erie, 607 miles from Montreal, then turning suddenly an acute angle, proceeded almost due north through Lakes St. Clair and Huron, 346 miles, to the point of juncture of the Great Lakes Michigan, Huron and Superior. If, however, instead of following the foregoing route, vessels could ascend the Ottawa and French rivers, the line of navigation between Montreal and the point of juncture of the three great lakes would be more direct and shorter by nearly one-half the distance. This route of the Ottawa and French rivers formed the old French route between Montreal and the Far West, and a word might here be said regarding it.

Leaving Montreal one entered the Ottawa at Ste. Anne and ascended that river as far as the mouth of the Mattawa, a tributary of the Ottawa, 305 miles above Montreal. Entering the Mattawa one ascended 44¼ miles to the upper end of Trout Lake which lies at the summit; then, crossing a low sandy ridge three-fourths of a mile wide, one descended to the northeast shore of Lake Nipissing. Thirty miles further, at about the middle of its length and on its south side, were the headwaters of one of the tributaries of the French River. Following the tributary and the French River to its mouth, a distance of 50 miles, one entered Georgian Bay at the northeastern end of Lake Huron.

The government of united Canada gave serious thought to this route, had it examined by engineers under the Department of Public Works, and procured two engineers' reports on it in 1858 and again in 1860. The first engineer reported on 22 March 1858[140] that the total length of the Ottawa route between Montreal and Lake Huron was 430 miles; that the distance between Montreal and Chicago by this route would be only 575 miles, while by that of the St. Lawrence and lakes it was 1,145 miles. He reported that all the obstructions to navigation between the two extremities would be overcome by the construction of a number of short canals the aggregate length of which (including the Lachine Canal) would be 58 miles, leaving 372 miles for river and lake navigation. He suggested the dimensions of the locks should be 250 feet long by 50 feet wide with 10 feet of water on the sills. He stated that in passing from Lake Huron to Montreal a vessel would ascend 83 feet to summit level and then descend 642 feet to the St. Lawrence at Montreal, thus giving for each passage a total rise and fall of 725 feet. Of these 725 feet, 698 would have to be overcome by means of locks. He further stated that by damming the mouth of Lake Nipissing at the head of the French River so as to raise the surface of the waters about 23 feet above the present level, a summit reservoir of 300 square miles would be formed which would be more than sufficient to ensure a constant supply of water on the summit reach. He estimated the cost of all the works necessary to complete the line of navigation at $24 million.

The second engineer reported on 2 January 1860.[141] He stated that the projected canals on the upper sections of the Ottawa and French rivers would be through Laurentian rock, the removal of which would be very expensive. He suggested that the length of the canal to be excavated might be reduced by the construction of dams across the rivers thereby converting the rapids into a series of still sheets of water with locks from one to the other. By this means the total length of the shortest sections of canals would be 29-3/10 miles instead of 58 miles as proposed by the engineer who reported in 1858. The second engineer proposed that 69 locks with 709½ feet of lockage would be required; that the locks should be 250 feet long by 45 feet wide with 12 feet of water on the sills. He estimated that the cost of the works would be $12,087,680 – just half that of the first plan. However, nothing further was done about this project prior to confederation.

There was yet another canal scheme which really formed the first part of the one for Georgian Bay. This was the scheme for improving the navigation of the Ottawa. The Chaudière Falls formed a barrier limiting the extent of the navigation of vessels leaving Montreal and ascending the Ottawa River. In the early

1850s public men became interested in the possibility of extending this navigation further up the Ottawa by means of canals. In 1853 surveys were undertaken to ascertain what works were necessary in order to extend the navigation from the foot of the Chaudière Falls to the head of Chats Lake, and in March 1854[142] the chief engineer of the Department of Public Works reported that to ensure 7 feet depth of water for the navigation between the Chaudière Falls and Chats Lake, it would be necessary to construct 6 miles of canal with locks of the same length and breadth as the lock at Ste. Anne. The length of navigable reaches and proposed canals between the Chaudière and the head of Chats Lake were given as, first, a Chaudière Canal 6 miles in length with a total lockage rise of 63 feet from the navigable waters below the Chaudière Falls to the foot of Chaudière Lake; second, 25 miles of navigable waters from the foot of Chaudière Lake to Rapides des Chats; third, a canal 2½ miles in length with a total rise in lockage of 50 feet from the foot of Rapides des Chats to Chats Lake, and fourth, a 25-mile stretch of navigable water on Chats Lake. It was decided to commence, at first, only the "Chats," the shorter of these two canals. Tenders were received for its construction and on 19 June 1854, a contract was entered into with Messrs. A. P. Macdonald and P. Schram.[143]

The works were commenced in August, 1854, and continued until November, 1856, when they were suspended since the contractors, who had undertaken the works at low rates, found themselves unable to proceed any further. The rock to be excavated proved to be much harder than was expected. The contract was cancelled and the contractors were paid for the work executed – the partial excavating of the pits for the five lower locks near the Chaudière Lake and the guard lock at the Chats. Some excavation was also made at the trunk of the canal between the lower locks and the guard lock. Stone was quarried and partly dressed for the construction of the locks, and a wharf was built at the foot of the canal. The amount paid to the contractors for the work done was $482,950.81.[144] Discussion again took place regarding the scale of navigation which should be adopted for the Ottawa River. Surveys were ordered but it was finally decided to postpone the completion of the work already commenced and they were not resumed before confederation.

vii

Following the completion of the St. Lawrence canals it was found necessary to deepen the navigable channel of the St. Lawrence. The dredging of Lake St. Peter, a widening of the St. Lawrence about 31 miles long by 8 miles wide commencing 8½ miles above Three Rivers, was undertaken. A shallow channel which wound through the lake presented obstacles to navigation early in the 19th century once vessels had begun to increase in size. In 1826 the Montreal merchants petitioned the Lower Canada legislature for a grant to be used in clearing the St. Lawrence in Lake St. Peter.[145] Four years later Capt. H. W. Bayfield, Commander of the Royal Navy, surveyed the lake and in his report of the following year,[146] 1831, stated that the upper end of the lake contained a number of alluvial islands formed by sediment brought down by the river and deposited in the more tranquil waters of the lake resulting in the formation of islands and shoals which contracted the width of the navigable channel. Bayfield also stated that it was problematical whether any efficient means could be devised to remove the impediments in the lake and river so as to enable vessels of greater draft of water than those presently engaged in the trade to pass through the lake to Montreal. A few years later in 1838 the Montreal Committee of Trade informed the legislature, in a petition,[147] that the lake was now so shallow that vessels drawing more than 10 to 12 feet of water were unable to pass through it. The petitioners also mentioned that they had been assured by scientific men that the ship channel through St. Peter could be deepened, without difficulty, to 16 feet.

Following the union of the provinces, the Board of Works ordered a survey of the lake with the result that dredging of a straight channel was begun in 1844.[148] However, this extensive work was suspended three years later due to lack of funds. In 1850 the Montreal Harbour Commission, in desperation, took over the work.[149] Instead of dredging a straight channel, the commissioners decided to follow the crooked natural one which was 11½ miles long and had a minimum depth of 10½ feet at low water. In November, 1852, the ship channel through Lake St. Peter was completed to 15 feet at low water. By 1860 this had been deepened to 17½ feet and five years later to 20 feet.[150]

viii

Before concluding this treatment of the St. Lawrence navigation a word should be said about the steam tug service which was started in 1849.[151] This service was required in each of the four sections of the St. Lawrence canal system (i.e., Lachine to Beauharnois Canal, Beauharnois Canal to Cornwall Canal, Cornwall Canal to Prescott and Prescott to Kingston) in order that vessels passing through these canals would experience little or no delay on the river and lakes connecting them. The route from Montreal to Lake Ontario was 168 miles long and included stretches of broad lake and strong currents on which tow paths for sailing vessels were impossible. Therefore, in 1849, the government granted a subsidy to a line of steam tugs between Montreal and Prescott which left each end of the line at stated intervals of time and towed vessels and barges at certain fixed rates according to the size and tonnage of the vessels. Three tugs were employed the first year (1849), two the second year and four the third year. There was no subsidy given in 1852, with unsatisfactory results. The subsidy was renewed, therefore, in 1853 when six tugs were employed to cover the whole river between Montreal and Kingston and the service was thereafter sustained by government aid. Following 1857, at least nine tugs were annually employed. As the trade of the St. Lawrence increased, the government subsidies decreased from time to time. The bonus given with the contract which expired in the fall of 1860 was $24,000; with that which expired in 1862, $20,000, and with that in 1863, $16,000 along with a tariff of 10 per cent less than that of the former contracts. The following is a statement for the year 1863 taken from returns furnished by the contractors indicating the number of towages on each division up and down and the amounts collected under the contract tariff.[152]

Up		
Lachine to Beauharnois Canal	939	$ 6,440.54
Beauharnois Canal to Cornwall	640	9,169.79
Dickinson's Landing to Kingston	559	18,665.09
Down		
Kingston to Dickinson's Landing	449	$10,141.88
Cornwall to Beauharnois Canal	482	4,618.62
Beauharnois Canal to Lachine	704	3,438.79

The total number of towages was 3,773 and the total amount collected under contract tariff was $52,474.71.

III

i

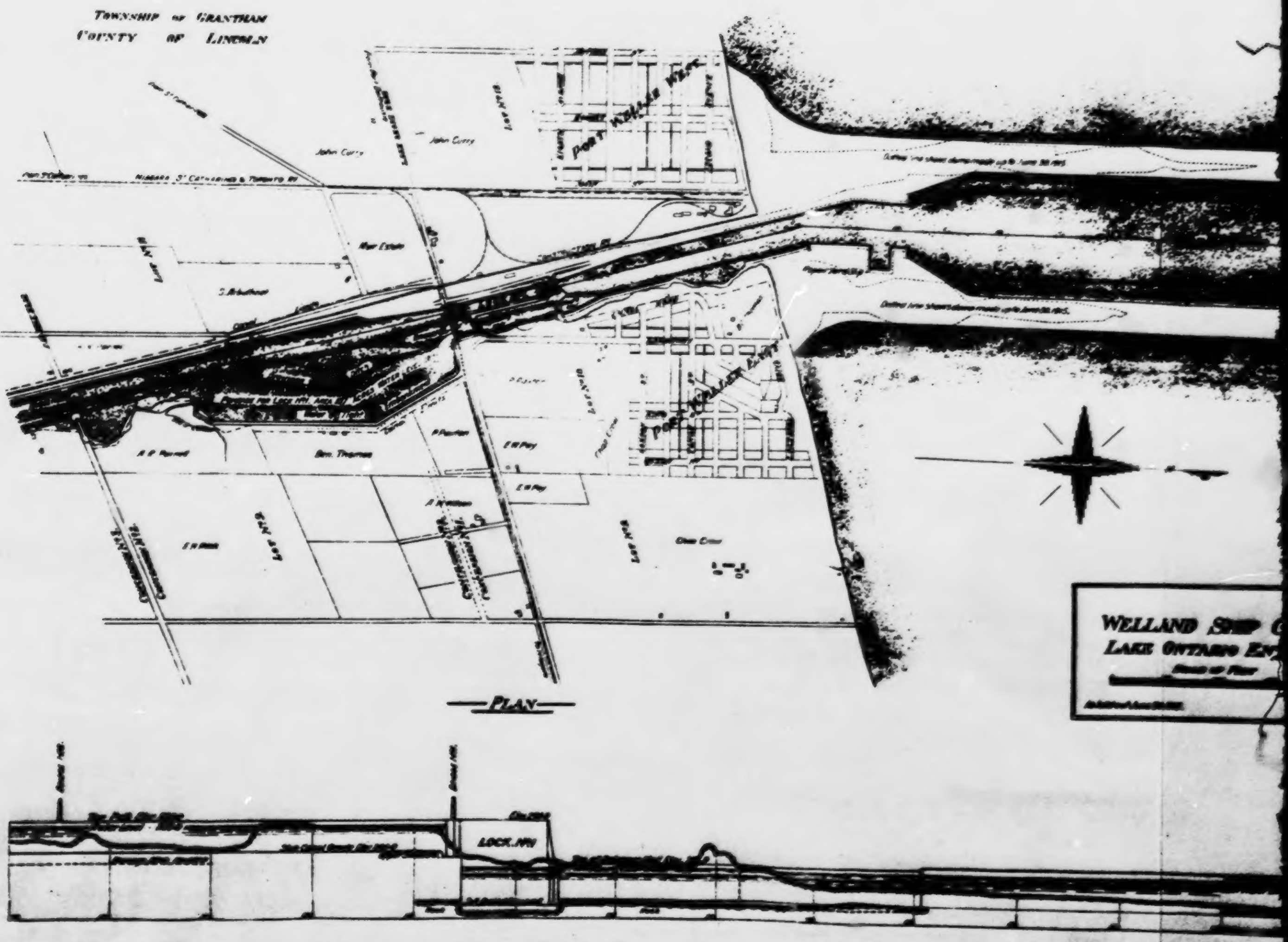
The period from 1842 to 1849 witnessed a change in British trade policy which affected the economic life in Canada.[153] Hitherto, under the policy of protection, the Canadas had enjoyed a preferential position in the British market. Britain's new trade policy, however, so affected the Canadian grain trade that in 1842 the number of sea-going vessels ascending the St. Lawrence fell off by 377, while in 1841-42 the volume of imports and exports fell off by £500,000. The passage of the Canadian Corn Act of 1843 by the imperial Parliament was an attempt to lessen the strain of the transition from protection to free trade by admitting Canadian grain and flour into the home market on a preferential footing and thereby to divert the grain of the western states to the Canadian waterways. For a short time this appeared to work. American wheat was imported, milled in Canada and re-exported as Canadian flour. As a result a large amount of capital was invested in the Canadian milling industry which was just beginning to work profitably when this whole trade was suddently crushed by the famous Act of 1846 which put an effective end to the Corn Laws and with them the preferential duties in favour of Canadian grain. The Americans now became the millers. They purchased Canadian grain, turned it into flour and sold it in the British market as American flour.

In the year the Corn Laws were repealed, Montreal received yet another blow when the American government created the bonding privilege whereby goods from western Canada could be sent through United States territory in bond and shipped to American ports.[154] Formerly the Upper Canada merchant had to bring in his entire yearly stock in summer due to the winter closing of the Canadian waterways, but now he could carry smaller stocks and replenish them whenever necessary by means of importation through United States territory over American railways.

With the opening of the enlarged Lachine Canal in 1848 the greatly improved St. Lawrence canal system was finally ready. This magnificent inland waterways system provided a seaway 9 feet in depth to the interior of the continent and cut freight rates in half between Lake Ontario and Montreal. But the construction of this system had so greatly increased the provincial debt that the Canadian government in 1848 had even considered briefly the repudiation of that debt. To meet the excess expenditure consequent upon heavy payments for public works, the government found it necessary to issue one million dollars of exchequer bills having one year to run and bearing interest at 6 per cent.[155] So poor was the provincial credit, however, that these bills quickly fell considerably below par.

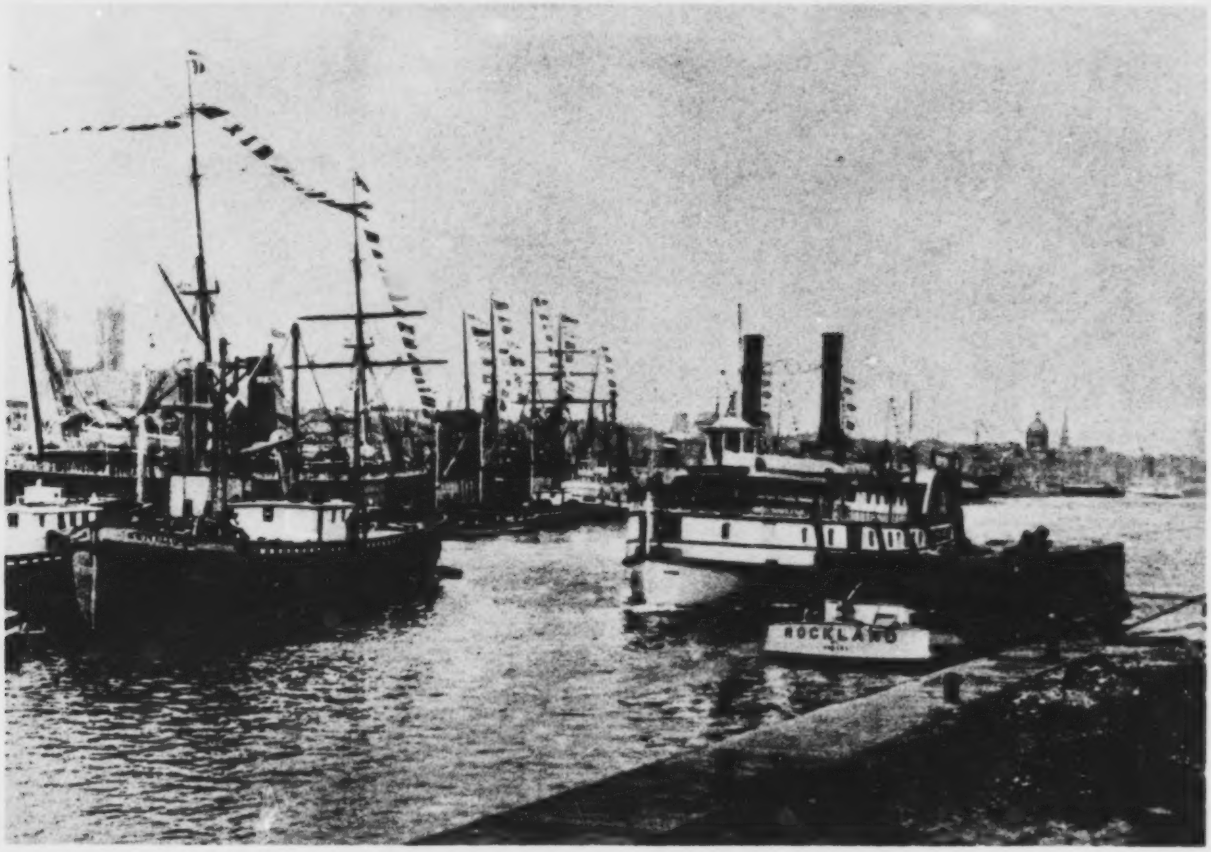
Unfortunately the expected increase in traffic using the St. Lawrence water-

29 Profile of Lake Ontario entrance of the Welland Ship Canal. (*Annual Report, 1915-16*, Dept. of Railways and Canals.)



Top of Embankment Elev 255.0
Top of Embankment Elev 255.0
LAKE ONTARIO
LLAND SHIP CANAL
E ONTARIO ENTRANCE

30 Shipping at the entrance of the Lachine Canal, Quebec, probably in the 1890s. (*Public Archives of Canada.*)



way did not materialize despite the strenuous efforts made to increase the flow of trade. It had been hoped that the repeal of the imperial Navigation Acts in June, 1849, which ended the exclusion of foreign vessels from the St. Lawrence, would result in an increase in shipping. But this had not happened. Moreover, by means of the American Drawback Acts and the advantages of a bigger port, New York enjoyed a preference over Montreal as an Atlantic outlet for the interior trade. At the same time the attempt of the Canadian government to find new markets in the United States through reciprocal free trade in certain products proved futile when the American government failed to pass legislation similar to the Canadian Act of 1849.[156] And finally, the pervasive world depression in 1849 adversely affected international trade thereby reducing the flow of goods through the Canadian canal system.

II

By the time the St. Lawrence waterway was completed and ready for traffic in 1848 the American railways, built "to handle western traffic and to avoid the difficulty and distance of the canals," were already carrying increasing amounts of freight to New York. Between Chicago and Buffalo the distance by rail was 500 miles whereas by waterways it was 1,000 miles. It was clear, therefore, that Canada needed to combine with her superior internal navigation a railway system connected therewith and mutually sustaining each other; otherwise the vast expenditure on communications would most likely remain unproductive. Hence the Grand Trunk Railway was designed in Canada to supplement the canals in their struggle to attract western traffic. Allan McNab, chairman of the standing committee on railways and telegraph lines, in the committee's first report dated 21 July 1851, stated:[157]

> *After a full consideration of the subject, Your Committee have come to the conclusion that the interest of the Province will be best consulted by the construction of a grand Trunk Line of Railway extending from Quebec to Windsor on the River Detroit, and connecting with any line which may be constructed between Halifax and Quebec. This great line is considered by the people of Canada as a Provincial undertaking and should be taken up as such, . . . as it will in the opinion of Your Committee, in conjunction with our magnificent chain of Water Communication, secure for Canada a large portion of the Trade and Commerce of Western America. The magnitude of the proposed line of Railway and the consequent expense of construction is such that its completion will be postponed for an indefinite period if left to private enterprise even though assisted by government under the provisions of the Guarantee Act. Your Committee are therefore glad to learn that the Government are prepared to act promptly and efficiently in the matter and to pledge the credit and resources of the Province in aid of the construction of the line.*

The Grand Trunk Railway was described as supplying

> *a means of intercommunication through the valley of the St. Lawrence during the whole of the year, an advantage which, owing to the river being frozen over for at least six months annually had previously been enjoyed during the summer. Even during the season when the navigation is open, the means of transport by water are imperfect. Seagoing vessels, of 700 to 800 tons burden, could proceed safely as far as Lake Ontario; but the limited dimensions of the Welland Canal made it necessary that the produce from Lakes Erie, Huron, Michigan and Superior should be conveyed to Lake Ontario in smaller vessels, not exceeding 300 tons burden. The Grand Trunk Railway was intended to obviate the necessity for the transshipment of cargo.*

This railway was completed from Toronto to Montreal in October 1856, which meant that Canada West now enjoyed through communication with Portland, Maine, over lines built three years earlier. However, instead of being supplementary to the canals, the Grand Trunk was competitive from the very beginning. The railway promoters, who had seen the English railways triumph over the canals, fully expected the railway to drive the steamboat traffic off the St. Lawrence. But this did not happen. In summertime the Grand Trunk faced stiff competition from the water carriers on Lake Ontario and the St. Lawrence. By 1859 it was realized that the railway could not compete with the water carriers for heavy traffic. Between Montreal and Toronto the water rate was from $2 to $3 per ton, while the rail rate was $3.50.[158] Nor could the railway, as it turned out, recoup its losses by charging heavier rates on the carriage of grain in the winter time for the producers simply stored their commodities until water navigation re-opened in the spring.

On the whole the Canadian trunk railways had little success in competing for western traffic. Like the canals they suffered because of the inability of the St. Lawrence route "to attract highly remunerative inbound traffic. Successful competition for bulky raw materials with low freight rates was handicapped by

the effectiveness of New York and American roads in attracting manufactured products."[159] There was no proportionate increase in the share of traffic which was divided between the railways and canals. At the same time, Canadian railways often intensified the struggle between New York and the St. Lawrence by favouring the New York route. Take the case of the Welland railway which was completed in October 1858 and built to solve the problem facing the Welland Canal of the bigger and more numerous propellers being unable to pass through. The railway received freight from vessels lightened to 10 feet of draft of water so as to pass through the canal, and in 1860 it "received the cargos of 230 vessels at Port Colborne, 150 of which were of such dimensions as admitted of their passing through the Canal."[160] In this same year, the line carried down 81,243 tons of grain, as through freight, to American ports and only 4,761 tons to Canadian ports.[161]

iii

By the 1850s it was abundantly clear that a very large share of the western trade in grain, both American and Canadian, found its way to the seaboard and the eastern states through American channels. It was equally clear that the best and cheapest channel of general commerce as regards transportation was the natural waterway (i.e., sea, lake, river) as against the artificial navigation of canals. And it was undeniable that Canada possessed through her natural navigation, which with the exception of 69 miles of canal embraced the entire distance from Chicago to the sea, the means of supplying the advantages of the natural waterway to a greater degree than the United States could hope to do. What, then, were the causes of the inadequate Canadian share of the western trade? Why did very much more of this trade not pass through the Canadian channels? Clearly there was a great discrepancy between the amount of western trade flowing through the Canadian channels and the considerably better construction and geographical position of the Canadian channels over the American.

As early as 1851 the diversion of the Great Lakes trade by the Erie Canal to New York was noted and attributed to the high price of ocean freight from Quebec to Liverpool.[162] It was held that because Canadian seaports were closed for five months of the year the St. Lawrence never would, regardless of how perfect the provincial internal communications were, attract extensive and varied commerce from all parts of the world. The suspension of shipping for five months neutralized the superior advantages Canada possessed of bringing produce to tidewater, for the higher ocean freight rates counterbalanced the cheaper inland transport. But why were ocean freight rates from the St. Lawrence higher than those from New York and Boston? It was believed that they must always be higher since cargos could always be obtained to the two American ports, whereas to the St. Lawrence a greater number of vessels than the import trade could profitably employ must lose the voyage westward and come in ballast.[163] "Export tonnage must keep pace with import."

In 1856 the amount of trade diverted to American seaports was 6,183,433 tons against 594,755 tons to Canadian ports.[164] In that year 4,022,617 tons were transported on the Erie (boat) Canal against 976,656 tons on the Welland (ship) Canal of which 625,132 tons were to and from American ports, against 351,524 tons to and from Canadian ports. This left only 243,231 tons from Lake Ontario to make up the 594,755 tons passing up and down the St. Lawrence to the seaboard through Canada.[165] In this same year 634,536 tons were transported on the St. Lawrence (steamboat) canals but of this only 39,681 tons passed to and from the United States; nearly 400,000 tons consisted of wood, timber, earth and minerals, leaving some 200,000 tons of merchandise and the productions of agriculture to and from the seaports of Montreal and Quebec.[166] At the same time the return of toll on the New York canals was $2,748,212; on the Canadian canals $344,888; $266,420 from the Welland and $77,720 for the St. Lawrence.

This diversion of the lakes trade by the Erie Canal to New York accelerated and in 1858 a government report stated that "the proportion of the lake trade diverted to New York is as six and a half million tons to about half a million forwarded to Quebec."[167] For the period 1855-60 the arrivals of grain at the two ports of Buffalo and Oswego averaged 1,313,277 barrels of flour and 27,527,088 bushels of grain, while for the same period the average shipments from Canadian ports seaward were but 205,821 barrels and 672,625 bushels.[168] From 1 September to 31 December 1859, shipments from Toronto alone were 63,627 barrels of flour, 805,224 bushels of wheat and 167,364 bushels for barley. Of these amounts the ports of Montreal and Quebec received only 19,715 barrels and 21,691 bushels of wheat or about 2 per cent of the latter, the remainder finding its way to Oswego and other American ports on Lake Ontario.[169] In 1859 "the entire shipments by sea from Canada were only 140,235 barrels of flour, 58,029 bushels of wheat and 434,328 bushels of other grain."[170] A few years later the supremacy of the American route over the St. Lawrence was clearly stated:[171]

> *The greatest drawback to the success of this (St. Lawrence) route, as a competitor for European trade is the high rates of ocean freight from Montreal and Quebec when compared with those from New York. The latter city being the great commercial emporium of the Northern States, controls the bulk of the import trade; consequently, freights rule lower at that port than any other on this side of the continent, because vessels arriving out with cargo can afford to carry produce to Europe cheaper than those trading to Quebec or Montreal, which, in great part, have to make the voyage here in ballast. Besides, as the staple exports of Canada are bulky whilst the tonnage of her imports is comparatively small, it is evident that we cannot hope to compete for European freights except by carrying so much cheaper on our line of internal communication, as to compensate for the advantage of the ocean voyage.*

Along with the lower ocean freight rates from New York there were other factors favouring an increase in traffic by the Erie Canal and later by rail to New York as against the St. Lawrence route to Montreal and Quebec. One of these was the application of steam to inland navigation. The use of bigger steam vessels on the upper lakes rendered the Welland Canal increasingly obsolete. In 1854 propellers totaling 21,181 tons were unable to descend through the canal to Lake Ontario.[172] Six years later one-third to one-fourth of the vessels in the grain trade could not pass the canal and nearly three-quarters of the propellers were too large.[173]

Deepening the Welland Canal did not really improve conditions. Prior to 1850 the canal had been built to a depth of 8 feet 6 inches on the sills with 27 locks of 150 feet by 26 feet to overcome a height of 330 feet. In 1853 the canal was deepened to 10 feet but its narrow locks remained and were responsible for the situation in which "the St. Lawrence canals can pass vessels (200 tons) of double the tonnage capacity of these (400 tons) which can get through the Welland Canal, yet their draught being one foot less, the same vessel which can pass through the latter canal, cannot without being lightened, pass through the St. Lawrence canals."[174] Or again: "the St. Lawrence canals were designed for side-wheel steamers; the Welland Canal for sail and screw steamers. A vessel with twenty-six feet beam may proceed to sea, from any of the upper lakes, by the route of the Welland and St. Lawrence Canals, but she cannot enter Lake Champlain with more than twenty-three feet or pass down the Ottawa route with more than eighteen feet beam. She may carry ten feet draft into Lake Ontario but must lighten to nine in descending the St. Lawrence."[175] The river was becoming, therefore, a serious handicap to the utilization of the St. Lawrence route.[176] This is shown in evidence given by Captain C. D. Price before a parliamentary committee in 1856. Price was the master of a vessel carrying freight from Chicago to Liverpool. He reported a detention of six days between Prescott and Montreal and when asked the cause of this he replied:[177]

> *It arose from the depth of water in the St. Lawrence Canals. Her draught was 9 feet 6 inches from Chicago through the Welland Canal to Dickinson's Landing where we had to lighten to less than 9 feet, which detained us two days. We were also detained two days in the Beauharnois Canal, where the level wa still less than in the Cornwall, and one day in the Lachine Canal arising from the level being drawn down by mills.*

And when asked about the expense of lightening through the canals Capta Price replied, "It averages about $250 for each vessel on her downward trip when they draw 10 feet. The Welland canal admits vessels of 10 feet 6 inches."

Five years after Price's testimony the Commissioner of Public Works reporte that:[178]

> *Although its tonnage capacity (Welland Canal) is nearly twice that of the Erie canal enlargement, still more than one-third of the steam vessels which navigate the upper lakes are unable to pass through it. The large and profitab class of propellers which now form the favourite means of transportation on Lake Erie, cannot descend into Lake Ontario. . . .*
>
> *If vessels of a large class could pass without breaking bulk, from Chicago to Oswego, or the sea* via *the St. Lawrence, it is believed that the Welland route could not fail to attract a large amount of the produce which now passes through the Erie Canal, and, no withstanding the prestige in favour of the old established lines and the attrac tion of the great commercial centre of New York, be successful in competing both for the through traffic to Europe, and for the carrying trade of the grain and flour consumed in the North Eastern States.*

Still another factor which aided in bringing about the unsatisfactory result in regard to the amount of traffic passing along the St. Lawrence route was the reduction and eventual removal, throughout the fifties, of the tolls from the American canals and New York railways. To meet this threat and at the same time to hope that an increase in traffic would result, the Canadian government finally passed an order in council, dated 28 May 1860, "abolishing tolls on the St. Lawrence Canals and refunding 90 per cent of the tolls paid on the Welland Canal to vessels entering the St. Lawrence Canals or hailing from any Canadian port and pushing upwards through the Welland Canal." This resulted in an increased tonnage "by 7½ per cent in 1861 over 1860 and in 1862 by 15 per cent over 1861." Yet the removal of tolls did not result in any substantial increase in western traffic.[179] The tolls were, therefore, reimposed in full in 1863. Whereupon traffic declined 8.26 per cent on the Welland Canal and 7.19 per cent on the St. Lawrence.[180] Improvements in facilities for transhipping grain at Kingston and Montreal along with other advantages could not prevent the continued decline in the proportion of traffic.

Finally, the operation of the United States coasting laws militated against a carrying trade using the St. Lawrence route.[181] American vessels were allowed to use the Welland Canal and thereby build up an extensive carrying trade between New York and Boston and the western states by way of the American lake ports of Ogdensburg and Oswego, a trade which could not exist without the use of the canal. But Canadian vessels were "excluded from any share of this carrying trade" by the operation of the United States coasting laws and "the growth of a similar trade from the British seaboard beyond the Provincial boundaries westward" was thereby checked.

IV

i

Let us now shift from a preoccupation with shipping and trade to yet another important role played by canals in the economic development of the Canadas, namely as a source of much needed water power to supply energy for the operation of various kinds of water-powered mills. Following the American Revolution the settlers pouring into Upper Canada created a pressing need for grist mills and saw-mills. To promote the erection of these much needed units the government supplied materials and offered special concessions to operators for a period of years. Settlement formed around the mill sites, and by the time the provinces united in 1841 each had about 400 grist mills and nearly 1,000 saw-mills while Lower Canada had, in addition, about 450 other industrial mills.[182]

In 1847 it was decided that the surplus water in the canals should be leased to manufacturing establishments, and between that year and 1867 water power and other property on the canals was leased to various parties.[183] Along the Welland Canal there were 69 leases running for a term of 21 years. This property was located at Port Dalhousie, St. Catharines, Allanburg, Port Robinson, Merrittsville and Port Colborne and was either a small lot, surplus water at the head of a lock or a lot near a waste weir. Such property was used for the operation of a grist mill, saw-mill, cotton factory, shingle factory, tannery, wharf, floating dock or wood yard. Each lease also stipulated the annual rental which in the case of the Welland Canal ranged from $20 to $720 per lease. Along the St. Lawrence River properties were leased for the usual term of 21 years at the Beauharnois, Williamsburg and Cornwall canals. There were 15 leases at the Beauharnois Canal consisting of either a hydraulic lot, building lot or wharf lot used for the operation of a grist mill, saw-mill, large paper manufactory and furniture manufactory – all propelled by water power supplied through the regulating weir built at each lock for passing and regulating the flow of water, or the head-race and regulatting weir at each end of the lower dam built for milling and manufacturing purposes. The annual rental per lease ran as high as $354. At the Williamsburg canals there were 22 leases located at Farran's Point, Rapide Plat, Iroquois Point and the Galops consisting of mill lots and wharf lots used for the operation of grist mills, flour mill, tannery and wharf. Water power required for each lease ranged from four to six runs and the annual rental was from $10 to $246 per lease. Nineteen leases were granted along the Rideau River system for the usual 21-year term. These were located at Green Island, Hog's Back, Long Island, Burritts Rapids, Merrickville, Smith's Falls and Brewers Mills and consisted of water lots and town lots used for the operation of grist mill, flour mill, saw-mill, and shingle mill. Each lease stipulated that the mill could use all the water not required for navigation and the annual rental ranged from $1 to $360 per lease. Four leases granted along the Trent River navigation for a term of 21 years were located at Chisholm's Rapids, Nine Mile Rapids and the concession of Ops. This property had been originally set aside as an education reserve but when leased it was used for mills as well as for the manufacturing and lumber trade. Property leased enjoyed the use of all the surplus water available and the annual rental per lease was from $1 to $36. Finally there were also a few leases granted along the Richelieu-Lake Champlain waterway. One of these was located at the St. Ours Lock and Dam and received all the surplus water needed to run a grist mill. Two leases with a water frontage of 226 feet each were located at St. Johns and used for the operation of a steam saw-mill and a tannery.

II

After 1855 industrial development was rapid along the banks of the Lachine Canal which provided the cheap water transport and an abundant supply of water power, estimated at 4 million horsepower, needed to make Montreal a great industrial centre.[184] There were 28 leases and 19 sub-leases of properties along the canal. These were located on both sides of St. Gabriel's Lock (lock No. 3), Côte St. Paul Lock (lock No. 4), Basin No. 1 and Basin No. 2 on the south side of the canal. The properties leased consisted of water lots and surplus power to be used in the operations of mills, factories, foundries, tool works, machine shops and marine works. The amount of water power needed for each mill or plant was stipulated in the lease.

Some idea of the amount of manufacturing associated with the canal may be formed from the following account. At Côte St. Paul Lock there were two flour mills capable of grinding 460 barrels of flour per day combined with stores and elevator capable of storing 105,000 bushels of grain and 6,000 barrels of flour. Here were located an axe factory, shovel factory, scythe factory, nail factory, auger factory, sash-and-door factory, a large saw-mill and a cooperage with saw-mill attached. All these plants were located on the south side of the canal below the lock. At the St. Gabriel lock there were two flour mills capable of grinding 310 bushels of grain and 55,000 barrels of flour. Also located here were three saw-mills, a plaster mill, a dry dock, two foundries and finishing shops, a cotton factory established in 1853 which produced 300 yards of denims and ticking and 1,200 pounds of batting in a single day; and a machine shop, cordage factory, tannery and glove factory, along with two sash-and-door factories. At Basin No. 2 there were three flour mills capable of grinding 1,250 barrels of flour a day along with four elevators with storage capacity for 540,000 bushels of grain and 34,000 barrels of flour, and in addition a grain drying establishment and elevator with storage capacity for 60,000 bushels. Also located here were a dry dock, two graving docks, three nail and spike manufactories, two rolling mills, a saw-mill, an oil and colour works, chemical and rubber factory, and a machine shop. All these mills and factories were erected within a few years at the locks on the line of the canal and contributed largely to the industry and trade of the country.[185]

Two of the principal works on the Lachine Canal were the Victoria Iron Works and the Canada Marine Works.[186] Victoria Iron, which started operating in 1859, contained a rolling mill which turned out 12 tons of nail plates per day chiefly from iron puddled at the works. Two thousand tons of plates were produced during the working months in 1862. The Victoria Iron Works' rolling mill in conjunction with another rolling mill in the area were capable of producing sufficient sheets of nail plate to supply all the needs of three local factories producing nails and spikes – two necessary aids to civilization. Prior to 1860 England and the United States produced most of the nails used in Canada. After that date Canadian industry was able. because of the water power supplied from the Lachine Canal, to produce nails in sufficient quantity to meet the needs of the home market. The other principal plant erected on the Lachine Canal, the Canada Marine Works, covered 15 acres of ground on which were erected a foundry, boiler and finishing shop. Here the machinery was driven by steam power. A shipyard, occupying much of the Canada Marine grounds, contained two basins each 500 feet by 100 feet in extent. Between 1845 and 1862 this yard built and launched 94 vessels, constructed primarily for the lake and river navigation, combining high speed with the greatest carrying capacity on a light draught of water. Along the two major works just described were several others of importance like the oil and colour works, the candle works, the chemical and india rubber works and the sugar refinery, nearly all of them operating by means of water power.[187] In its course, therefore, the St. Lawrence furnished water power for manufacturing purposes which was practically unlimited in extent and which, with the Great Lakes as reservoirs, was possibly the most permanently available in the world. The water power was conveniently distributed between localities such as Montreal, Cascades, Cedars, Coteau du Lac, Long Sault, Niagara and Sault Ste. Marie while a vast aggregate of power was also available from the tributary waters of the great river.[188]

III

The propriety of leasing the surplus water of the canals was seriously questioned by some interests including the forwarders.[189] Those who favoured leasing the surplus water urged that manufacturers were by this means placed in immediate connection with the navigable waters; that it was a great advantage to mill owners to have water power readily available for their needs, that it gave a direct revenue to the government in the form of rent and indirect revenue arising from the promotion of commerce by mills and factories so situated on the canal basins as to be accessible to shipping. On the other hand there were certain disadvantages. A government report in 1860 stated, in respect to the Lachine Canal,[190]

> *The Canal has been maintained in an efficient state, and the river having continued high throughout the season there has been no difficulty in keeping up the supply of water to the mills, but such is the increase of machinery and the rise of water, by the mills established on the line of the Canal, that it is very much to be feared, when the river falls again to its ordinary level, that there will not be a sufficient supply of water to keep them all going without admitting a current in the Canal that would become a serious impediment to the navigation.*

Forwarders complained of this impediment to the canal navigation arising from the strong current created by the withdrawal of a large body of water required by the manufacturers situated on the banks of the canal for the propulsion of their machinery. This current was a great inconvenience to vessels passing through. Interests opposed to the leasing of surplus water reasoned that the water power should be drawn from sources other than the canal itself except in places where the quantity of water required was too limited to make it of any importance from what source it was derived.

V

Canals influenced Canadian fiscal policy. Increased expenditure by the Canadian government on public works particularly in transportation and navigation during the 1850s and 1860s involved dependence on British capital which in turn involved the need for increased revenues to enable Canada to pay the interest on the money borrowed. Up to 1861 payment on the following public works – canals, lighthouses and other works connected with the development of the St. Lawrence navigation – represented £3,962,900 of the total Canadian debt. At that time duties on imports formed the basis of revenues. When, as minister of finance, Galt increased the tariff on imports in 1856 and again in 1858 and 1859, he suggested that "this was designed to raise revenue to pay interest on British capital invested in improved facilities for transport and that improvement in transportation eliminated the protectionist character of the tariff."[191] Manufacturers endorsed this argument claiming "that improvements in transportation exposed them to more effective foreign competition." An example of this was the iron industry in Canada West. There, a charcoal furnace had been erected at Lyndhurst as early as 1800 and the next two decades found several others erected in Hastings County and elsewhere. However, the completion of the St. Lawrence canals, which cut the cost of imported ore, forced most of these furnaces to close permanently after 1848.[192]

VI

Though they failed in their primary purpose of diverting the trade of the continental hinterland down the St. Lawrence, the canals enabled the Canadian producers to compete in world markets. They assisted materially in the functioning of a Canadian commercial policy based on maintaining trade with Britain and developing trade with the United States. At the same time, their construction along with that of the early railways indicated clearly Canada's decision to avoid, if possible, any form of "continental integration with the United States." It seems clear that prior to confederation Canada's canals contributed greatly to her preservation as a viable political entity.

Canals in the New Confederation, 1867-1914

I

At the time of confederation, Canadians still clung to the belief that nature had intended the St. Lawrence to be the great commercial highway of the West. They clung to this belief despite the fact that in relation to western trade the St. Lawrence route had not fulfilled its destiny to the extent it should have done. It had not yet received anything like the amount of traffic to which it was entitled by virtue of its superior facilities. When one considers the formidable nature of the opposition arrayed against it, however, the route had perhaps not done too badly. The St. Lawrence ran through British territory whereas the great bulk of the population and commerce was on the American side of the river and lakes. Quite naturally enterprising communities like the state of New York, deeply interested in the prosperity of American canals and railways, had wooed away much of the western trade from the St. Lawrence. At the same time the facilities afforded by American enterprise for the transit of western products proved somewhat inadequate and American interests, especially those concerned in obtaining cheap routes of communication with the principal markets of the world, approached the Canadian authorities on the question of transit. Commissioners appointed by the state of Illinois to confer with the Canadians on the question of transit stated:

> *For several years past, a lamentable waste of crops already harvested had occurred in consequence of the inability of Railways and Canals leading to the seaboard to take off the excess. The North West seems already to have arrived at a point of production beyond any possible capacity for transportation which can be provided except by the great natural outlets. It has for two successive years crowded the Canals and Railways with more than one hundred millions of bushels of grain, besides quantities of other provisions and vast numbers of cattle and hogs. This increasing volume of business cannot be maintained without recourse to the natural outlet of the lakes . . . . The St. Lawrence furnishes for the country bordering upon the lakes a Natural outlet to the sea.*[1]

About the same time the report of the Buffalo Board of Trade for 1869 concluded:

> *It would be folly to ignore the fact that a great increase has taken place in the trade of Canada with Europe in breadstuffs. The route* via *the St. Lawrence leads almost in a direct line from the grain growing regions of the West to those nations of Europe whose people are and will be the chief consumers of the grain exported from this country. By a liberal Canal policy we may arrest this division of trade and restore the traffic of very many important articles which seek other channels through lower rates of transportation . . . . The trade of Chicago with the Dominion has largely increased both in imports and exports. The Canadians hope to establish a large direct foreign trade by way of the St. Lawrence to and from the West, exporting wheat by the vessels used in the trade, returning with iron, salt, hardware, glass, crockery, carpets, drugs, dyes, etc., and the estimated value of such imports alone foot up to $40,000,000. Would not a reduction of tolls on the Canal Erie somewhat disarrange this programme? Two plans are proposed for receiving the trade of the great West by the Canadians. The one is, to enlarge the Canals around the rapids of the St. Lawrence, and to increase the capacity of the Welland Canal to a degree whereby vessels of large tonnage can pass direct to and from the Upper Lakes; the other contemplates a Northern route by improving the navigation of the Ottawa River, which flows into the St. Lawrence at Montreal. The first route mentioned is the most feasible, least expensive, easier maintained and can be made available longer during the year.*[2]

II

I

In 1870 the Canadian government appointed a royal commission with instructions

> *to institute and make a thorough enquiry as to the best means of affording such access to the seaboard as may best be calculated to attract a large and yearly increasing share of the trade of the North Western portion of North America through Canadian waters as well as a thorough and comprehensive improvement on the canal system of our said dominion on such a scale and of such a character as would best tend to afford ample facilities for the expansion and due development of its growing trade and commerce . . . and such as will enable Canada to compete successfully for the transit trade of the great Western County.*[3]

The commission made a careful study of the Welland Canal and recommended that it be enlarged and improved. In order to achieve this betterment the commission suggested: (a) that a new canal be built from Thorold to Port Dalhousie; (b) that the locks, banks and weirs on the present line be raised so as to give 12 feet of water; (c) that the harbours at Port Colborne and Port Dalhousie be deepened to 15 feet in order to provide a safe entrance to vessels drawing 12 feet of water; (d) that the main line between Thorold and Port Colborne be widened and deepened to 100 feet wide at bottom and 13 feet depth; (e) that a second lock be built at Port Colborne so as to allow more water into the canal, and (f) that the floor of the aqueduct be sunk 2 feet and possibly another aqueduct be constructed alongside the present one in order to increase the supply of water required for the double set of locks from Thorold downward.[4] By far the most important of these suggestions was that of an entirely new line from Thorold to Port Dalhousie.

As the commission explained:

The reaches between the present locks on the Mountain declivity are entirely too short, and of too small capacity for the enlarged canal. The locks are so close together and even supposing it possible to construct the large locks on this line without stopping the navigation, and to make use of one of the present walls to form part of the new locks, still the enlarged locks would be placed so close together that there would not be left a vessel's length between them. They would be tantamount to combined locks the operation of which is to retard the passage of vessels and cripple the efficiency of the canal.[5]

Since, therefore, combined locks could not be admitted on this important navigation, it was necessary to find a line where sufficient "basins can be established between the locks to admit of the passage of vessels and capable of holding an abundant supply of water for working the lock without drawing over the levels." The commission suggested that while the new line from Thorold to Port Dalhousie was being built, the present line should be maintained at full working capacity and indeed ought to be deepened and kept in good working order for the use of smaller vessels. The 24 smaller locks were located on the 8 miles between Allanburg and St. Catharines and were 150 feet long by 26½ feet wide. Originally designed and built for 9 feet of water, the depth was later increased to 10¼ feet by "bolting down timber upon the copings of the walls and by raising the banks and weirs." This increased the tonnage capacity of the vessels navigating the canal from 400 to 500 tons net. An additional 1¾ feet would increase the tonnage capacity from 500 to 600 tons. This additional carrying capacity of vessels would allow some shipowners to pass through the canal without lightening their cargo as they were forced to do when heavily laden. The commission concluded its report on the Welland with the suggestion that "the temporary timber now used to raise the water should be replaced by masonry and the lock gates, weirs and banks, should be permanently finished to the highest level."[6]

ii

Considerable attention was given to the proposed canal at Sault Ste. Marie. There, as early as 1852, the Department of Public Works made a survey for a Canadian canal. This survey called for a straight cut through the middle of St. Marys Island which is about one-half mile long. The distance between the deep water bays at the upper and lower entrances corresponding with the length of the canal from end to end of the piers would be a little over a mile. Lake Superior, at the northern end of the proposed canal, fluctuated in water level between a rise and fall of about 18 inches. The fall in the Sault rapids varied, according to the different stages of the lake and river, from 17 to 19 feet with a usual fall of 18. This early survey in 1852 was made at a time when the side-paddle steamers reigned supreme on the upper lakes. Hence the chief engineer of the department proposed to build the canal of sufficient size to pass the largest class of side-paddle steamers at that time employed in the trade. The proposed dimensions for a lock were therefore 350 feet long by 66 feet wide with 10 feet depth with the prism of the canal 130 feet at bottom and 140 feet at surface in order to allow two steamers to pass one another on any part of the canal. The estimate for this canal with two locks, which it was necessary to build when the breadth was so great, was $480,000.[7] Following a careful study of the early survey, the commission was prepared to accept the line of the straight cut through the middle of St. Marys Island but suggested that due to the more moderate scale suggested for the canal system of the dominion, it would be quite practicable to overcome the whole fall at the Sault by a single lock of 18 feet lift.[8] This would avoid the expense of the regulating weirs required if two locks were constructed to divide the lift. The commission regarded the construction of a Canadian canal at Sault Ste. Marie as "the natural commencement of the improvements of the inland navigation of the Dominion."[9]

iii

Reference has already been made to the dredging operations on the St. Lawrence between Quebec and Montreal in the years immediately preceding confederation resulting in a marked improvement in the channel of navigation. After 1865 a larger and better class of sea-going vessels, including Atlantic steamers of 3,000 tons capacity, had access to Montreal, the effect of which was a reduction in the cost of freight and a spur to Canadian business. Since the proposed enlargement of the canals would likely bring a great increase of business to Montreal, the commission believed it was essential that better port facilities should be available to Atlantic vessels frequenting that port thereby allowing them to compete successfully with New York and Boston shipping for the carrying trade to European ports.[10] At this time (1870) the largest vessels trading at Montreal drew from 18 to 23 feet laden, without coal, and ranged from 290 to 350 feet in length. It was felt, however, that the security of the navigation required that the channel be as wide as the length of the vessel and the depth fully one foot more than the draught. The commission, therefore, recommended the enlarging of the channel throughout between Quebec and Montreal to 400 feet width and 24 feet in depth at low water.[11]

In 1870 daily passenger vessels successfully descended all the rapids between Kingston and Montreal. Returning, these vessels used the Lachine, Beauharnois and Cornwall canals but had sufficient power to ascend the upper rapids, Rapide Plat, Iroquois and Galops, without entering the canals. Freight vessels, however, seldom navigated the lower rapids of Long Sault, Coteau, Cedars, Cascades and Lachine, though such vessels could safely descend the upper rapids. For some time it had been urged that improvements be made in the channel through the lower rapids "as would enable all vessels and express by the propellers to pass down safely without making use of the canals thus saving time and expense."[12] This the commission felt must be done.

Still considering the St. Lawrence navigation, the commission concluded, from both the evidence laid before it and information contained in the annual reports of the Public Works department, that there appeared to be an urgent necessity for improvements in the Lachine Canal in order to better accommodate the trade. Vessels were overcrowded in a limited space afforded both in Montreal harbour and in the upper basin of the canal. Great delays occurred in passing vessels through the two lower locks forming the connection between the harbour and canal. With increasing trade, matters only got worse. It was clear that the entrance locks were wholly inadequate to the requirements of the trade. The commission reported:

To meet increasing demands of the trade at this port we consider it indispensable that the former entrance to this canal should be reopened and another set of locks laid alongside the present ones, in the line of the old canal, with 17 feet of water on the sills to admit ocean vessels into the upper basin, and that the whole of the canal reserve containing upwards of fifty acres, be laid out into docks and basins in the manner suggested in the report just quoted but instead of proceeding gradually with the improvements, the whole as far up as Wellington street should at once be undertaken and made 18 feet deep.[13]

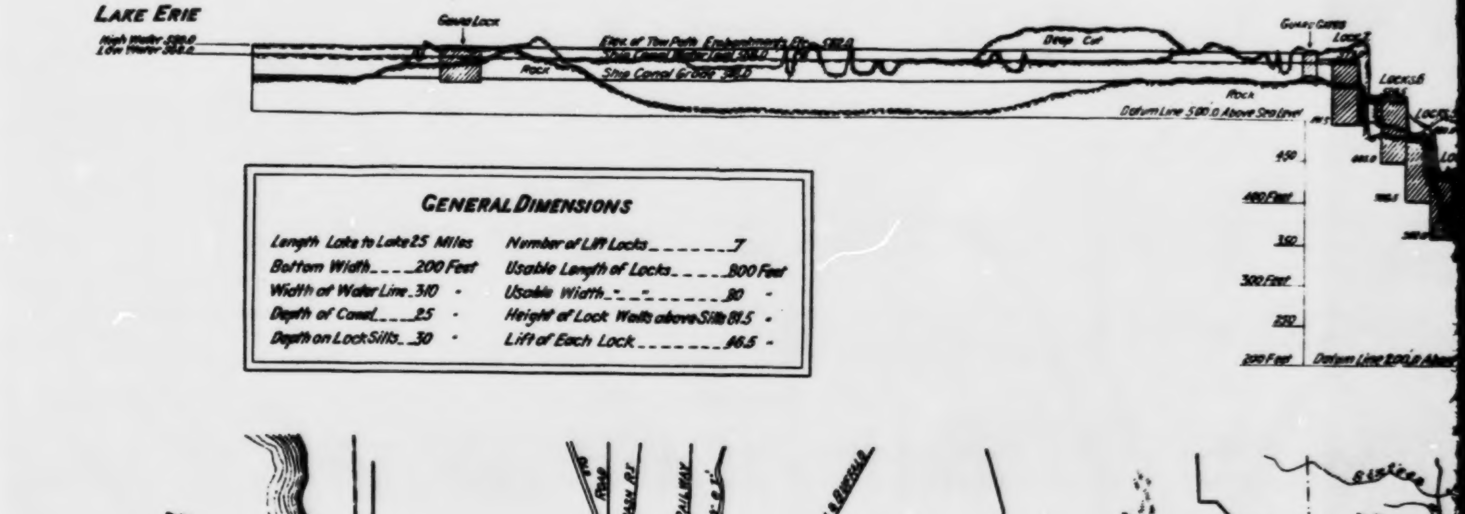
By the phrase, "in the report just quoted," the committee was referring to the report of the commissioner of Public Works for 1860 which stated:

By opening new basins on the south side of the canal, and deepening the channel through the middle of the large basin up to them, sea-going vessels may with facility be brought in connection both with the Upper Lake vessels and the Grand Trunk Railway for the draught upon the sills of the two lower locks has been made 16 feet expressly with this view, and the requisite quantity of land has long since been acquired and is still retained for that express purpose.[14]

iv

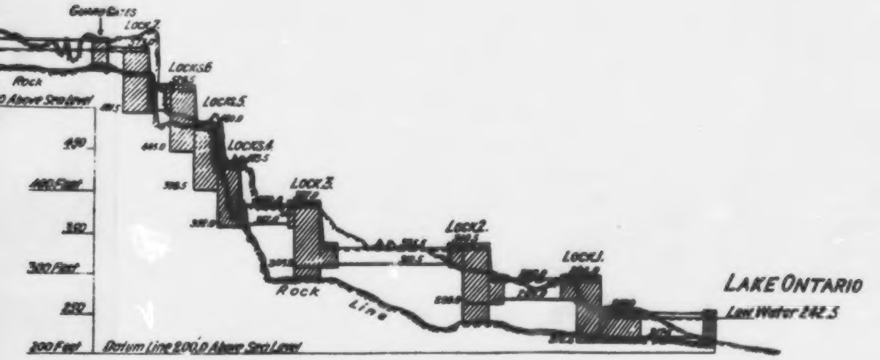
During a 50-year period (1822-73) the governments of the Maritime Provinces and Canada considered at various times the possibility of building a canal to connect the waters of the Bay of Fundy at Cumberland Basin with those of the Gulf of St. Lawrence at Baie Verte. Robert C. Minnette made the first survey in 1822 by order of the government of New Brunswick and proposed a canal 4 feet deep, running through the valley of the Aulac across the Missiguash lakes and then to the River Tidnish. Three years later F. Hall also made a survey of the route at the suggestion to the lieutenant governor. Sometime later Thomas Telford, a civil engineer, revised Hall's report and suggested a canal with a depth of 14 feet with a view to accommodating the large trade that would likely accrue especially with Quebec, Montreal and the upper lakes.[15] Meanwhile public opinion in New Brunswick became quite vocal about the proposed canal. One citizen of Saint John addressed an appeal to the Rt. Hon. William Huskisson in 1828 stating: "The meditated improvement in this province of opening a canal from the Bay of Fundy to the St. Lawrence is an object of national interest and peculiarly worthy of the attention of governments; and which by affording facilities of intercourse will create an extensive business with our Canadian neighbours which is at present very limited."[16] A

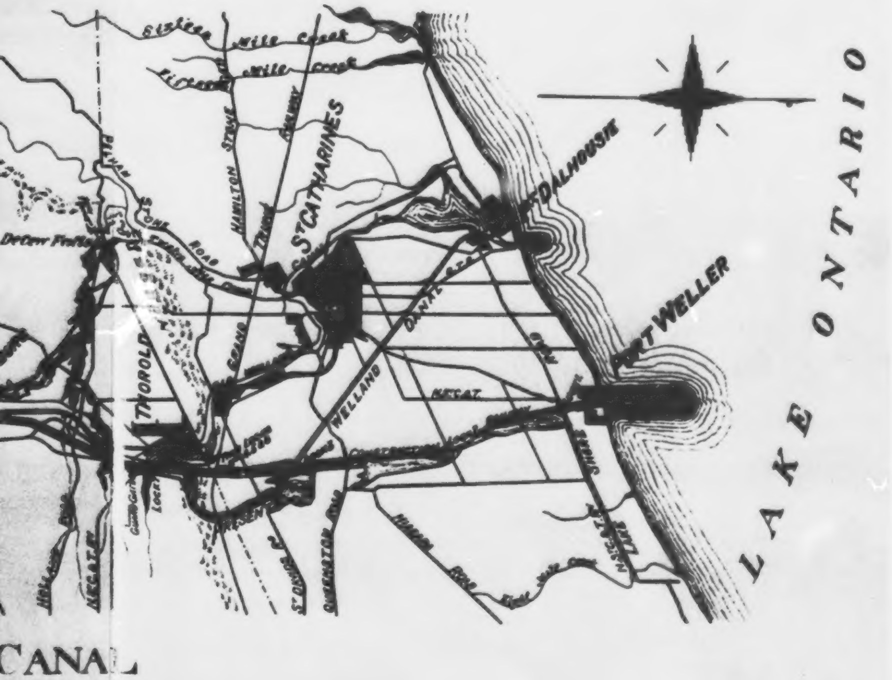
31 Plan of the Welland Ship Canal with general dimensions. (*Annual Report, 1915-16*, Dept. of Railways and Canals.)



GENERAL DIMENSIONS

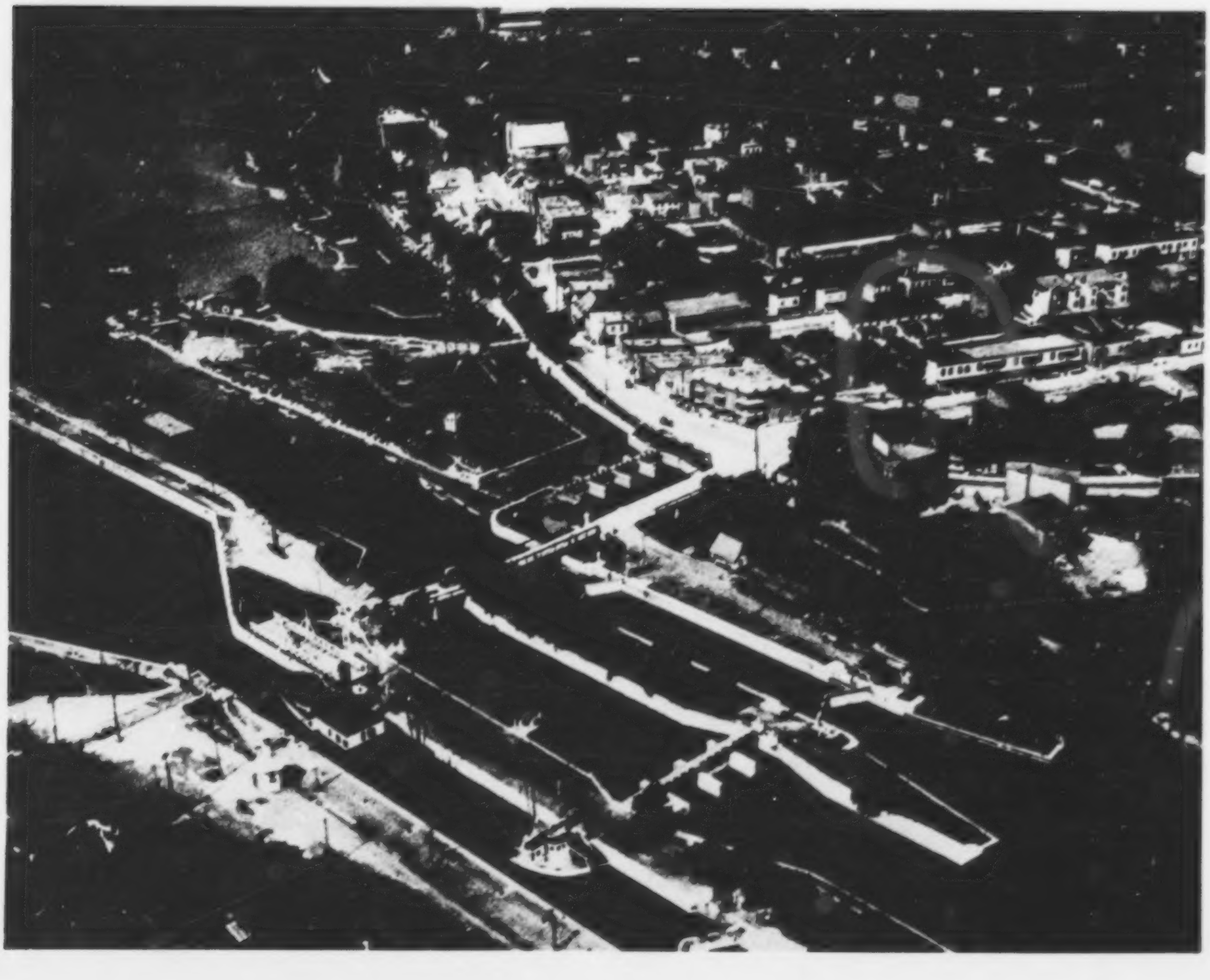
Length Lake to Lake	25 Miles	Number of Lift Locks	7
Bottom Width	200 Feet	Usable Length of Locks	800 Feet
Width at Water Line	310 "	Usable Width	80 "
Depth of Canal	25 "	Height of Lock Walls above Sills	81.5 "
Depth on Lock Sills	30 "	Lift of Each Lock	46.5 "


Guard Gates
Lock 7
Locks 6
Locks 5
Locks 4
Lock 3
Lock 2
Lock 1
Rock
Rock Line
450
400 Feet
350
300 Feet
250
200 Feet
Datum Line 200.0 Above Sea Level
LAKE ONTARIO
Low Water 242.5


Sixteen Mile Creek
Fifteen Mile Creek
St. CATHARINES
DALHOUSIE
PORT WELLER
THOROLD
WELLAND
HAMILTON STREET
LAKE ONTARIO

CANAL

32 The Lachine Canal locks from the air, about 1920.
(*Public Archives of Canada.*)



decade later the Saint John Chamber of Commerce addressed a petition to Lieutenant Governor Sir John Harvey, which perhaps merits quoting in full, urging the advantages of a canal across Chignecto.

That a Canal to connect the Waters bordering the possessions of Great Britain in North America has long been an object of consideration, not only with numerous private individuals, but also with the Legislature of this Province, who have had surveys and estimates made, and have been prevented from commencing the undertaking in consequence of the large sum required for its completion, and also, we apprehend, from want of confidence in the surveys.

That the work, according to a survey made by Mr. Hall, the particulars of which he forwarded to the late celebrated Sir Thomas Telford, was by that gentleman, on Mr. Hall's data, estimated to cost £155,898 sterling but this calculation does not seem to your Petitioners an exception to the observation above made. We much question, had that gentleman been on the spot, if he would have relief on the uncertain and periodical high-tide mark, as the most proper level for the range of a Canal. Should a stranger observe that one part of your command is completely cut off from all water intercourse with another more extensive and important part of the Province, save by a voyage of eight hundred miles, while a Canal of fifteen or seventeen miles, through a particularly level country, would completely connect and bring them together, he would be astonished that no attempt has yet been made to cut such a Canal.

That on 16th March, 1836, the Legislature of this Province passed an Act, (at the suggestion of several persons who probably dispaired of a canal being cut) for the purpose of incorporating the "Shediac and the St. John Railroad Company," or in other words, an Act to authorize the parties named, and their associates, to make a Railway from the Harbour of Shediac to the most convenient spot for a landing Harbour on the head waters of the Bay of Fundy; said Railway to be completed in six years, or the Charter to expire. And on the same date a like Law was enacted, to Incorporate the Bay of Verte "Canal Company" with a capital of only £90,000 sterling which Charter is to expire and end if the object is not completed within ten years from its date. The Legislature of the Province of Nova Scotia, during their last Session, passed an Act authorizing the Lieutenant-Governor of that Province, for the time being to Incorporate any persons who shall within ten years make such progress in cutting a Canal from the Bay of Verte to Cumberland Basin, as may satisfy the then Commander-in-Chief that the Canal will be completed within some reasonably distant period.

That not only is New Brunswick in an especial degree interested in this undertaking but that the extensive and growing trade between this Port and Quebec, makes it certain that the Canadas would join warmly in promoting what would so much advantage their commerce. That various products of the Eastern part of Nova Scotia would find a ready and advantageous market at this Port; – that fleets of small vessels would be fitted out in this Province for general trade on the shores of the St. Lawrence, and also for the Gulf Fisheries, if such a Canal were completed. Another object of vast importance to the British Government, as well as the trade of the North American Colonies and the West Indies, seems likely to be attained by the completion of this work. We refer to the opening of a safe and easy passage to Quebec, several weeks earlier in the Spring *than can be reckoned upon by the present route, and wholly avoiding the great danger of encountering the ice between Newfoundland and Cape Breton, or in the Gut of Canso. We believe it is well known that a clear passage along the Northern shore of New Brunswick, and thence by Gaspé to Quebec, is generally open in the month of April, and frequently in its first week.*

That Prince Edward Island would be greatly benefited by such a Canal; and that the trade of the whole Colonies would thereby be increased in times of peace, and their energies become closely united in time of war.[17]

Further surveys were undertaken by orders of New Brunswick, Prince Edward Island and Canada including one in 1843 by Captain Crawley, with Canada paying a portion of the expense. A number of the engineers who reported on the project approved a tidal canal. Others advised that a supply of fresh water should be procured for operating the proposed canal. Despite all these reports the project was still being debated at the time the royal commission was appointed in 1870. The commissioners were attracted by the project and believed that the Baie Verte canal was closely linked with the canals of the St. Lawrence. They therefore strongly recommended its construction as inseparably connected with the growth of interprovincial trade.

A steamer laden with flour for Saint John, N.B. now goes down the Gulf as far as Shediac where the cargo is transported by rail to its destination. The total distance by water from Shediac through the Gut of Canso and around the east of Nova Scotia to the Bay of Fundy as far

> *as the commercial capital of New Brunswick is concerned is about 600 miles. Hence there is little or no direct communication between the Bay of Fundy Ports and those of the River St. Lawrence. By a canal through the Isthmus the distance from Shediac to Saint John will not be much more than one hundred miles.*[18]

The commission went on to point out that the lumber and fishery interests of the Gulf of St. Lawrence both of Prince Edward Island and the north shore of New Brunswick along with the coal trade of Pictou would benefit by a safer and shorter route not only to the ports of the Bay of Fundy but also to those of the northeastern coast of the United States. Construction of this canal would give a spur to the mackerel fisheries of the Gulf of St. Lawrence by which a short and secure route would be given to the inhabitants of the north and south shores of the bay as well as those in the Nova Scotia counties of Yarmouth and Shelburne. "As a Canadian canal at Sault Ste Marie is the natural commencement of the improvements of the inland navigation of the Dominion, so to work through the Isthmus of Chignecto is the inevitable conclusion necessary to give unity and completeness to the whole system."[19]

V

Improvement of inland navigation was essential to the promotion of interprovincial trade. Between Ontario and the lower ports direct trade could not be developed unless canal communication above Montreal were improved. Any appreciable growth of interprovincial trade depended upon cheap transit since goods passing between the maritime provinces and Ontario "must be of a bulky character requiring large vessels and rapid despatch to be really profitable." If a propeller could go direct with a cargo of coal or other produce of the eastern provinces shipped to Kingston or Toronto and in return take a freight cargo of flour, barley and other western produce, interprovincial trade would enter a new area. The Toronto Board of Trade believed that a deepening of the canals would lead to increasing trade with the Maritimes, for then "it would be carried without breaking bulk from the lakes to the ocean, creating thereby a reciprocity of interest, and connecting over several Provinces more closely."[20] At the same time the Toronto Corn Exchange Association declared

> *that reciprocity of trade, upon which we must count as the only basis of legitimate commerce, and the one great means of uniting the Provinces in the strong bonds of mutual interest, remains undeveloped, and will continue so until our water communications shall have been permanently established on such a scale as to induce the building of vessels suitable at once to the navigation on the lakes, the canals, and ocean.*[21]

The short interval between confederation, the abrogation of the reciprocity treaty with the United States and the commission's report in February, 1871, witnessed an increase in interprovincial trade. The proportions, however, were still relatively small due largely to a shortage of facilities for cheap and rapid transportation between the provinces. The Grand Trunk, of course, ran a line of steamers between Portland and Halifax which facilitated trade between Montreal and the Nova Scotia port. Moreover, steamships plying the Gulf of St. Lawrence between Quebec, Shediac, Pictou and other ports helped to promote trade in the chief provincial staples, the coal of Nova Scotia and the flour of Ontario. A few figures will indicate the slow steady increase in this trade. Canada exported 58,233 barrels of flour to Nova Scotia in 1865. In 1869 this had increased to 131,336 barrels to Halifax alone via the Grand Trunk Railway. Total shipments for four years via the Grand Trunk to Nova Scotia and New Brunswick were as follows: 1866, 157,859 barrels; 1867, 228,345 barrels; 1868, 328,204 barrels; and 1869, 293,754 barrels. The total quantity of flour exported from Canada in 1864-65 to all British North America was 137,581 barrels. In 1869 this quantity had increased to 542,412 barrels. Of this quantity 293,754 were sent by Grand Trunk Railway via Portland and the remainder by steamers and sailing vessels by the St. Lawrence.[22] During the same period Nova Scotia coal found a steadily expanding market in Quebec.

Improvement of inland navigation was also essential to the promotion of western trade. Any improvement would particularly affect the western flour and grain trade from which the canals derived the principal part of their income. At this time the Grand Trunk was a formidable competitor for the trade of the St. Lawrence and flour was carried largely by rail. Bulky products like corn and wheat, however, went by canal. This competition between canal and railway produced one significant result; namely, that the canal business of seven months exceeded the railway business of twelve months. It was found that the charges of a railway running alongside a good water communication had to be lowered during the summer months to an extent that was probably not profitable. Freights from the West to Montreal at the time were lower than those from Chicago and other western ports to New York via Buffalo and Oswego. The average rates paid per bushel by propeller from Chicago to Montreal during the years 1868 and 1869 were 13 cents and 12 cents respectively, whereas the average rate of freight per bushel of wheat from Chicago to New York during the same years via Buffalo and Oswego was 23 cents. Moreover, the difference in time was in favour of the St. Lawrence, and hence much of the trade was forced into its natural channel despite the lack of an enlarged and uniform system of canal communication. Once the capacity of the St. Lawrence canals including the Welland was enlarged, the propellers in use on western waters could come directly to Montreal and Quebec, and there transfer their cargoes to the larger class of vessels for European traffic or go to Boston through the Gulf of St. Lawrence and the Baie Verte canal (thereby shortening the route to Portland and Boston by nearly 500 miles). Freights of western produce would be reduced to a minimum. In the keen competition between the rival routes, Chicago-New York via the Erie Canal and Chicago-Montreal via the Welland and St. Lawrence canals, an important element was that of return freights. New York drew the commercial marine of the world and vessels carrying wheat, corn and other.products of the grain-growing western states had never wanted return freights. Up to 1870, however, the direct foreign trade with the West via the St. Lawrence was comparatively small, through increasing. Ocean transportation charges were an important factor in accounting for the modest trade.[23]

Besides considering the question of canal improvement in relation to interprovincial commerce and western trade, the commission also viewed such improvement as an important aspect in future commercial relations with the British and foreign West Indies. In 1870 Nova Scotia and New Brunswick were the only parts of the dominion which did any large business with those countries. Quebec and Ontario had virtually no trade with them. Any imports which those two large provinces received from the West Indies came through the United States and American ports. The commission believed that a large direct trade should be opened up between western Canada and the West Indies, which at the time purchased from the United States goods which could be supplied more cheaply from Canada. Improvement of the St. Lawrence canals might induce Ontario to open a direct trade with the West Indies, for the province had many of the products which those countries needed. And a Baie Verte canal would open "a shorter and safer route . . . to propellers and sailing vessels." Moreover, Ontario and Quebec merchants could supply those maritime firms engaged in this trade with such goods as found a ready and remunerative market in the tropics. In exchange the Canadian merchant could get back sugar, molasses and other semi-tropical produce which at the time was supplied indirectly to the two larger provinces through the United States. And finally in regard to this potential trade, the commission believed that the large type of vessel, which would likely be built as a result of an improved inland navigation, could proceed from Ontario lake and Quebec river ports to the Maritime ports and thence to the West Indies, where during the winter season such vessels might find employment instead of being laid up for five months of the year.[24]

vi

In the conclusion of its report dated 24 February 1871, the commission urged upon the government a policy of canal enlargement as one best suited to stimulate the commercial development of the whole dominion. According to the commission there should be one uniform size of lock and canal throughout the main line of water communication from Lake Superior to tidewater including the Welland Canal, the St. Lawrence canals and the proposed canal at Sault Ste. Marie. After much discussion the commission decided that the most suitable size of lock for these canals would be one having 270 feet length of chamber between the gates, 45 feet in width and 12 feet of clear draught over the mitre sills. Some persons urged a draught of 14 feet and others as much as 16 feet. The commission, however, keeping in mind the limited resources of the young dominion, the capabilities of the Canadian canals and harbours as well as the actual needs of the trade, agreed upon a draught of 12 feet as the most suitable one for the St. Lawrence. For the Ottawa route, extending from Lachine to Ottawa, the commission proposed a scale of improvement with locks 200 feet length of chamber between the gates, 45 feet in width and 9 feet of clear draught over the mitre sills. The scale recommended for the Chambly canal corresponded with that of the Ottawa with the exception that the draught might fall short of 9 feet should it involve considerable expense to reach that depth. Since both the Ottawa and Richelieu routes would be used principally for conveying lumber from Ottawa to the American market, it was thought that the canals along these routes should be built with approximately the same dimensions.[25]

III

The Canadian government accepted the royal commission's recommendations and decided to enlarge the canals; the scale of navigation in the St. Lawrence throughout was fixed at an available depth of 12 feet of water instead of 9 feet in the Lachine, Beauharnois, Cornwall, Farran's Point, Rapide Plat and Galops canals, and instead of 10½ feet in the Welland. The dimensions of the locks on the enlarged canals were fixed at 270 feet between the gates and 45 feet in width instead of 200 by 45 feet. The least breadth of the canals at bottom was fixed at 100 feet. In 1873 this enlargement was authorized to be carried out on the Lachine and Welland canals and subsequently on the Cornwall Canal. Two years later, in 1875, strong representations were made to deepen the various channels for the passage of vessels drawing 14 feet of water. The government assented to this need for deeper channels and orders were given to place the foundations of all permanent structures on those parts of the works not then under contract at a depth corresponding to 14 feet of water on the mitre sills. These orders applied to all the principal works on the main line of navigation between Lake Erie and Montreal. Such dimensions would enable vessels of almost any ordinary build to pass carrying fully 1,000 tons burden.[26]

Work on the Lachine, Cornwall and Welland canals was proceeded with in accordance with these directions. Work on the Welland was completed for a draught of 12 feet of water except at the point where the canal was carried by an aqueduct over the Chippawa River, where the draught was limited to 11½ feet for vessels using their own motive power. For vessels in tow, however, the draught could be 12 feet. At the same time a new scale of navigation was adopted for the route between Montreal and Ottawa. Here the dimensions of the new locks at the Ste. Anne, Carillon and Grenville canals were fixed at 200 feet by 45 feet, the depth of water on the sills at 9 feet and on the canals at 10 feet. The scale of navigation on the Rideau, however, was not altered.[27]

Meanwhile St. Peters Canal connecting the Bras d'Or lakes of Cape Breton and the ocean was the only canal in actual operation in the Maritime Provinces. Commenced in 1854 by the government of Nova Scotia, construction was suspended for a time but was renewed again in 1864 and the canal was finally completed in 1869. Navigation of this canal extended through Cape Breton Island. Boularderie Island divided the channel from the eastern end to the Bras d'Or lakes. The northern channel, called the Great Bras d'Or, was about 20 miles long with a depth of 4 fathoms, while the southern channel called the Little Bras d'Or was about 12 miles long with a depth of 7 fathoms. Proceeding eastward across the Little Bras d'Or Lake one reached Barra Strait, about one mile long and half a mile wide, and this point was considered to be the head of tidewater. Then one proceeded across the Great Bras d'Or Lake and through St. Peters Inlet, 6½ miles long. There one reached the St. Peters Canal, cut through the isthmus, and passing through the canal reached the western end of the navigation at St. Peters Bay. As completed in 1869 the canal was 2,400 feet long and 26 feet wide at bottom. It contained only one tidal lock 122 feet long by 26 feet wide at water surface and a depth of 13 feet on the sills. The canal had four pairs of gates at St. Peters Bay. It was seen at once that the canal was altogether too small to handle the traffic offering. Accordingly in 1872 the government decided to include St. Peters in their general scheme for enlargement of canals. Surveys were made in 1872-73, and in 1875 a contract was let for enlarging the canal and lock to the following dimensions: lock 200 feet long by 48 feet wide with 18 feet of water on the mitre sills at low tide and a width in the prism of canal of 48 feet. While this work was being done St. Peters was closed to navigation from June, 1876, to October, 1880.[28] The canal was again closed to navigation for the period from December, 1894, to November, 1895, to permit the renewal of the four pairs of lock gates and to make repairs to the lock bottom.

St. Peters was an important factor in the general coasting trade of Nova Scotia and Prince Edward Island. Much of the coal shipped from Sydney to the maritime ports passed through it as well as limestone from the quarries in the Bras d'Or lakes en route to Charlottetown. There was also a large quantity of farm produce carried through the canal from Prince Edward Island to points in Cape Breton. Moreover, at one time a considerable quantity of gypsum passed through the waterway from the Bras d'Or Lakes to the United States, but this traffic ceased when it became unprofitable owing to the size of the canal limiting the size of vessels engaged in this trade. During the 1911 season of navigation, 1,253 vessels were passed through St. Peters. In addition to these a large number of small craft (principally fishing boats measuring from 7 to 10 tons burden) used the canal.

In September, 1910, the resident engineer inspected the canal and found the whole of the works in a very bad state of repair. Therefore, in August 1911, tenders were invited for the construction of a new lock and entrance at the Atlantic end of the canal. The lock was to be 48 feet wide by 300 feet long between gates opening in the same direction. It provided for a depth of 18 feet of water on the mitre sills at low tide. It had a rock bottom. The side walls of the lock, and the entrance walls for a depth of about 400 feet on each side, were built of concrete. The contract for the work was signed in November, 1911, but, owing to the lateness of the season, no attempt was made to commence operations till the spring of 1912. The depth through the canal was 17 feet.[29]

Another Nova Scotia canal deserving of mention was the Shubenacadie Canal connecting Minas Basin and the Bay of Fundy with Dartmouth Cove in Halifax Harbour by way of the Shubenacadie River, Grand Lake and the Dartmouth lakes through the counties of Colchester, Hants and Halifax. This canal was 44 miles long with 15 locks and was designed for a navigation of 8 feet draught. Francis Hall made the original survey in 1825, and construction was undertaken by a joint stock company under a charter granted in 1824 by the government of Nova Scotia and afterwards extended by an act passed in 1827. The province granted lands and a money loan to the company toward construction of the canal. Work was started in 1827 but was never completed as originally planned, though a certificate signed by the governor of Nova Scotia in 1862 states that the water communication between Halifax Harbour and Minas Basin was then completed. No practical use was ever made of the work as a canal. It was designed for the purpose of conveying lumber, minerals, gypsum and grain from ports on the Bay of Fundy to Halifax, there to be shipped abroad.[30]

Before leaving the Maritimes a brief mention should be made of yet another canal project. Since the high tides and the silt-laden waters of the Bay of Fundy were major difficulties in the construction of the Baie Verte canal,[31] H. G. C. Ketchum, an engineer, projected a ship railway to transport vessels a distance of 17 miles from Amherst, at the north of the LaPlanche River to Tidnish on Baie Verte. Ketchum first revealed his plans and details of the scheme at the Mechanics' and Manufactures' Exhibition at Saint John, New Brunswick, in 1875. Seven years later the Chignecto Marine Transport Company was incorporated with a total share and bond capital of $5.5 million to carry out the project. In 1886 the dominion government granted the company an annual subsidy of $170,602 for 20 years, or such portion of that time as might expire before the company earned 7 per cent on its authorized share and bond capital. If the earnings exceeded 7 per cent per annum, the surplus over and above that amount was to be paid to the government until the whole subsidy paid had been refunded. On its part the company engaged to construct works capable of raising, transporting and lowering vessels of 1,000 register tons with full cargo.

Construction was begun at Amherst on a large dock equipped with gates 30 feet high to retain the water after the recession of the Fundy tide. This dock was 530 feet long, 300 feet wide and 40 feet deep. It was large enough to accommodate at one time six vessels of 1,000 register tons each.

Once a vessel was in the dock it was to be guided over a huge lift equipped with a ship carriage or cradle, which ran on two hundred and forty wheels. Power from twenty large hydraulic presses was then to be applied to the lift and the ship elevated to the level of the railway on land. Heavy locomotives were then to draw the carriage with its marine burden on double tracks at the rate of ten miles an hour to the terminus of the line, where, by similar means, it was to be lowered into the water. At Tidnish, the Northern terminus, a dock with gates was not necessary because the tides of the Gulf of the St. Lawrence had a range of only from six to seven feet.[32]

Though the project appeared practicable from an engineering point of view, it was never completed. Construction was started and continued for a time and it was thought that the undertaking might be finished in 1892. However, financial difficulty forced suspension of the work. The dominion government extended the completion date but asked for some assurance that capital to complete it was available. No such assurance was given and the subsidy lapsed. "The partially completed Chignecto ship railway remains only as a sorry monument to millions of dollars of wasted capital."[33]

At the same time (1876-80) as the St. Peters Canal in Cape Breton was being enlarged and improved, the St. Francis Canal was being built in western Canada. Situated near the outlet of Rainy Lake on the north side of Grand Falls, this canal was located 237 miles northwest of Prince Arthur's Landing on Thunder Bay and 215 miles southeast of Fort Garry, Manitoba. Its purpose was to improve transportation between Lake Superior and the Red River country by opening the navigation of Rainy Lake with that of Rainy River and the Lake of the Woods. In 1875 work was begun on the canal to be 800 feet long by 36½ feet wide with one lock 200 feet long by 36 feet wide having 7 feet of water on the sills. In January, 1879, it was reported that the lock was nearly completed but that the lock gates should be deferred until the materials for such a purpose could be brought by the C.P.R. However, due probably to the operation of the new C.P.R. line from Thunder Bay to Manitoba, further construction was discontinued, the outstanding debts were settled and the project left unfinished. The total cost up to the time the work was suspended equalled $288,275.51.[34]

Another work in western Canada was St. Andrew's Lock located on the Red River in Manitoba and first opened to traffic in 1910. Built and operated by the Department of Public Works, St. Andrew's consisted of a lock and dam at Lockport on the Red River about 15 miles north of Winnipeg and afforded communication between that city and Lake Winnipeg. In 1912, 95,549 tons of goods passed through consisting almost entirely of forest and mining products.[35]

One projected canal, which was seriously considered during the decade of the seventies and on which some work was done, was the Ottawa ship canal.[36] During the decade following confederation steamboat navigation on various portions of the river above the city of Ottawa extended as far as the mouth of the Mattawa River, a distance of 192 miles. Of this distance, 120 miles between Ottawa and Joachim Rapids were navigable for vessels of 6 feet draught of water, and 50 miles between the Joachim Rapids and the mouth of the Mattawa for vessels of from 3½ feet to 2 feet draught during low water. Among the principal obstructions to a continuous line of navigation were the rapids of Calumet situated 66 miles above the city of Ottawa. The Culbute Canal was built to overcome this destruction by connecting the navigation between the village of Bryson at the head of the Great Calumet Falls and the village of Aberdeen at the foot of the Joachim Rapids, a total distance of 77 miles. The canal was commenced in 1873 and completed in 1876. It comprised two combined locks of 200 feet by 45 feet each with 6 feet of water on the sills. Two submerged dams were constructed in order to raise the water in the north channel of the Ottawa from Bryson to Culbute: one of the dams was on the north channel below Bryson near the foot of Calumet Island and the other dam was on the south channel toward the head of the same island.[37]

IV

I

After 1880 there was a renewed interest in canal construction due in part to the greater attention being given to the problem of providing cheap transportation for the shipment of grain from the expanding area west of the Great Lakes. Already in 1871 the royal commission studying canals regarded the construction of a Canadian canal at Sault Ste. Marie as "the natural commencement of the improvements of the inland navigation of the Dominion."[38] The relatively slow development of commerce on Lake Superior largely accounts for the comparatively late construction of this canal in the St. Marys River connecting Lake Superior and Lake Huron. Previously a ship canal with 11½ feet depth and two locks to connect Lake Superior and Lake Huron had been constructed on the United States side of the river between 1853 and 1855 by the state of Michigan. Finally in 1887 the Canadian government made a survey of the ground and contracts were let for the construction of a canal on St. Marys Island.[39] The work was divided into three sections.[40] The first commenced at the navigable channel of St. Marys River below the rapids and extended upstream to the foot of St. Marys Island a distance of 5,300 feet. The second extended from the foot to the head of St. Marys Island, a distance of 3,500 feet, and embraced the excavation of the prism of the canal and lock pit, the guard gate, side walls, etc. The third section extended from the head of St. Marys Island 9,300 feet to the navigable channel of the river. A contract for the lower entrance was entered into on 30 January 1889; for the upper entrance on 26 March 1889; and for the canal and lift lock on 20 November 1888. The project, as covered by these contracts, comtemplated a lock chamber 600 feet long and 85 feet wide with a depth of water on the sills of 16¼ feet at the lowest known water level. However, the possibilities of the Canadian West developing as a wheat-producing country resulted in pressure being applied to the Canadian government to increase the dimensions of the lock. Whereupon, under authority of orders in council of 21 May and 3 June 1891, a supplemental agreement was entered into with the contractors for the canal and lock whereby the following dimensions were to be adopted; length of lock in chamber 650 feet, width 100 feet, depth of water on the sills 19 feet, the time for completion being extended one year to 10 May 1893. Further discussion took place in Parliament during the session of 1891 regarding the desirability of making the entrance of the lock in a straight line with the walls of the chamber. A second supplemental agreement was therefore made with the contractors on 5 April 1892, the dimension of the lock to be as follows: length of chamber 900 feet, width 60 feet throughout, with a depth of 20 feet 3 inches of water on the sills at the lowest recorded stage of the water in the river below the lock, the date for completion being fixed as 31 December 1894.

The desirability of completing the work at an earlier date resulted in a further agreement being made with the contractors on 8 November 1892 for the completion of all works under their contracts by 1 July 1894, including the deepening of the canal prism to a further depth of 4 feet, making it 22 feet below the lowest known river level. The contract for the electric light and power plant for the canal was awarded to the Canadian General Electric Company, 9 May 1894. The large lock permitted three vessels, one behind the other, to be locked through simultaneously: one of the lake type 320 feet long and two of the Welland Canal type 255 feet long, with ready means of entrance and exit on a course through the gates and lock straight with the line of the canal. It was opened for navigation in 1895 and the increase in traffic over the next decade was astounding. With the development of the Canadian West there was a steady growth in the volume of waterborne wheat while the development of the mineral and timber resources along the north shore of Lake Superior added to the volume of trade. Moreover, the tendency at the time was to increase the size and carrying capacity of vessels resulting in a greater flow of goods.

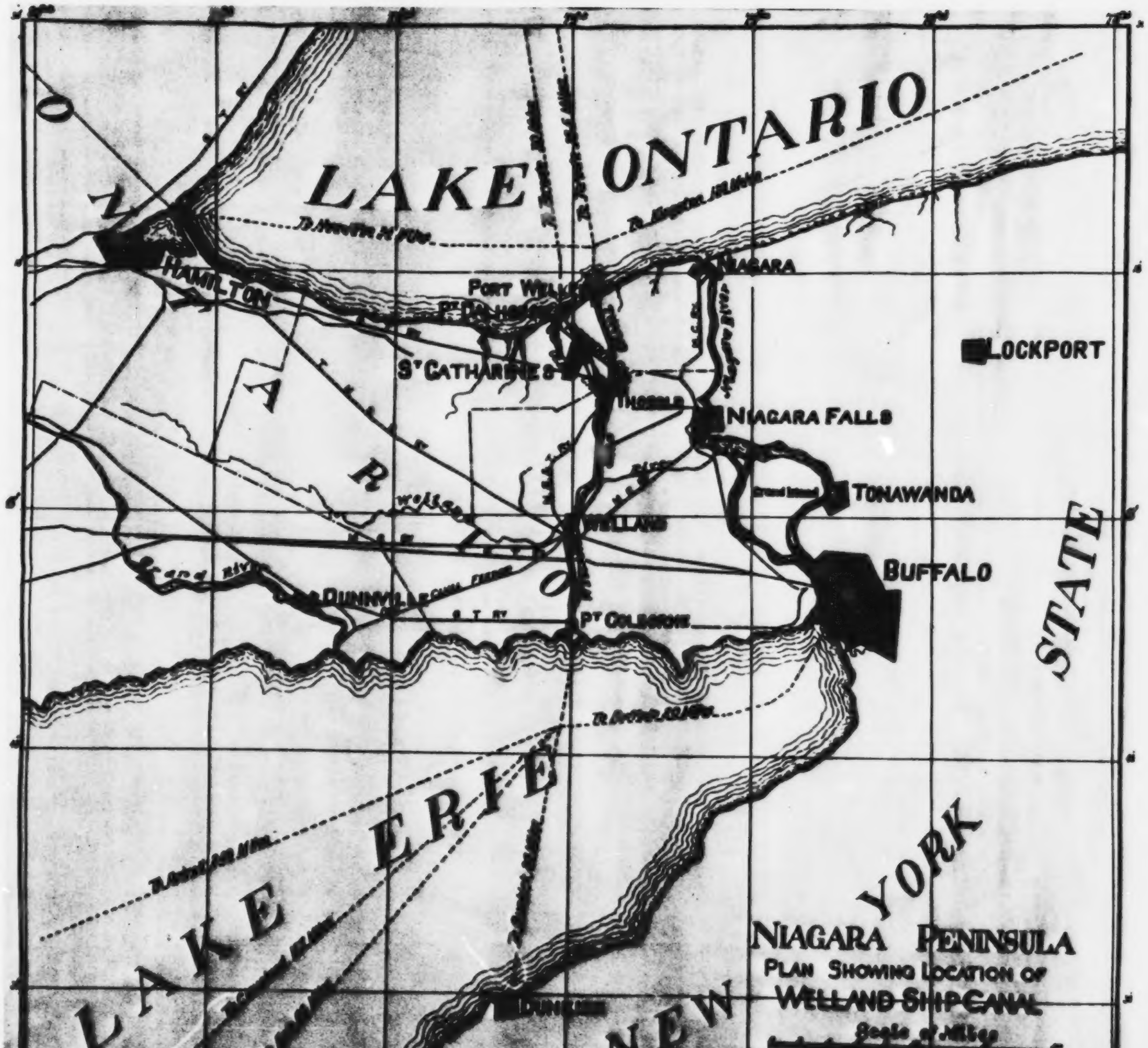
The following figures will give some indication of the volume of traffic pouring through the Canadian canal at the Sault at the turn of the century. During the 1901 season the total movement of freight was 2,820,394 tons carried in 4,204 vessels with 2,910 lockages. Of wheat, 9,639,627 bushels, and of other grain, 2,769,425 bushels passed through the canal along with 1,245,243 barrels of flour, 1,596,549 tons of iron ore, 510,393 tons of coal, and 12,553,948 feet of lumber.[41] Two years later during the 1903 season, these figures rose to 5,511,868 tons of freight carried in 4,351 vessels with 3,242 lockages. Of wheat, 32,232,315 bushels, and of other grain, 6,154,448 bushels passed through the canal along with 2,808,927 barrels of flour, 2,683,000 tons of iron ore, 998,780 tons of coal and 30,609,187 feet of lumber.[42]

II

The year which saw the Canadian government survey the ground for the Sault Ste. Marie Canal also saw the completion of the third or New Welland Canal, begun about 1873, to a depth of 14 feet. The first Welland Canal completed in 1829 with locks 100 feet long by 22 feet wide carried all the traffic between the lakes until 1845. The second canal opened in 1845 had locks 150 feet by 26½ feet with 9 feet of water on the mitre sills. After being in operation only eight years, it was found to be too shallow and the lock walls and banks were raised to allow vessels of 10 feet draught to pass through. Moreover, the locks were eventually enlarged to 200 feet by 45 feet with a depth of 19¼ feet on the mitre sills. This canal was in operation till 1881 when it in turn was replaced in 1883 by the New Welland with locks 270 feet long by 45 feet wide with 12 feet of water on the sills.[43] However, the canal was not completed before a further change was made. The lock walls and banks were again raised to allow vessels drawing 14 feet of water to pass through. The new completed canal had 26 locks, one less than the old line.

The Welland Canal now had two entrances from Lake Ontario to Port Dalhousie, one for the old, the other for the new line. From Port Dalhousie to Allanburg, 11¾ miles, there were two distinct lines of canal in operation, the old line and the enlarged or new line. From the head of the Welland Canal a deep water navigation extended through Lake Erie, the Detroit River, Lake St. Clair, the St. Clair River, Lake Huron and the St. Marys River to within a short distance of the Sault canal, a length of 394 miles.[44] A glance at the following figures will give some indication of the quantity of freight passing through the New Welland Canal in the years immediately following its opening. During the season of 1892, 955,554 tons moved through the canal of which quantity 929,946 tons was through freight and 25,608 tons local freight; 685,348 tons of freight passed eastward and 270,206 tons passed westward. Canadian vessels carried 245,739 tons of the through eastbound freight and United States vessels carried 420,527 tons. Of the westbound freight Canadian vessels carried 22,267 tons and the United States vessels 241,413 tons.[45] The quantity of grain (barley, corn, oats, peas, rye or wheat) which passed down the Welland to Montreal from ports west of Port Colborne increased from 180,694 tons in 1882 to 261,954 in 1892.[46] The total quantity of freight passed eastward through the Welland and St. Lawrence canals from Lake Erie to Montreal in 1892 was 263,144 tons, and westward from Montreal to Lake Erie was 9,452 tons.[47] The total quantity of freight passed eastward through the Welland Canal from United States ports in 1892 was 300,733 tons and westward 240,332 tons.[48]

33 Plan showing location of the Welland Ship Canal in the Niagara Peninsula. (*Annual Report, 1915-16*, Dept. of Railways and Canals.)



iii

The Soulanges Canal, constructed during the 1890s, was a principal and most important link in the enlarged St. Lawrence navigation. Ever since the royal commission had reported in 1871 recommending a scheme of canal enlargement, much thought had been given to the problem of how best to obtain the required canal accommodation between Lakes St. Louis and St. Francis. A decision had to be made whether to enlarge the existing Beauharnois Canal on the south side of the St. Lawrence by which the intervening rapids were then surmounted, to construct a new canal on the south side, or to construct a new canal on the north side of the river. As early as 1872-74, surveys were made for an enlarged canal between Lakes St. Louis and St. Francis. These surveys reported in favour of a route between Coteau Landing and Cascades Point on the north shore with a 12-foot navigation, the scale adopted prior to 1875. Between these two points the fall in the river was relatively much greater than on any similar length of the St. Lawrence between Lake Ontario and tidewater. Following these surveys of 1872-74, nothing further was done in this matter until 1889 when extensive excavation was begun with a new 14-foot navigation. Finally after considerable discussion, the government adopted the line recommended in the early part of 1891. An order in council, dated 7 February 1891,[49] decided upon the construction of the new work on the north side of the river and adopted a line extending upward from Cascades Point to Macdonald's Point near Coteau Landing. As contemplated by the order in council, the canal would be on practically a straight line 14 miles long comprising five lift locks overcoming a total rise of 82½ feet. Four of the locks would lift 17½ feet each and one was of variable lift along with a guard lock at the upper end of the canal. The dimensions of the locks were those of the enlarged system; namely, 270 feet long, 45 feet wide with a depth of 14 feet of water on the sills. The summit level was about 10½ miles long and for more than half of this length the canal would be in embankment below the mean level of Lake St. Francis.[50]

To ensure rapid transit and the minimum cost of maintenance, the most up-to-date and most approved system of construction and operations was adopted for the Soulanges Canal.[51] Construction plans for it differed significantly from those hitherto carried out on the enlarged Welland, Cornwall and Lachine canals. Concrete was used where deemed advisable throughout the locks and weirs instead of stone masonry and timber, as was previously used. For example, the foundations in the lock bottoms were entirely of concrete and stone instead of the usual timber. The Soulanges had side walls differently proportioned to those of the Welland with a heavier cross-section and wider base. The locks were filled and emptied through culverts formed in the side walls running the whole length of the chamber and connected with it by numerous openings. The upper gates were placed upon a curved breast of solid masonry, while none of the gates were pierced by valve holes and all were operated by electrical power. Moreover, the weirs regulated the height of water in the several reaches by an automatic electrical apparatus connected with their sluice gates and the water would therefore not be partly discharged over a breast as heretofore.

The position of the Soulanges Canal, as regards line and level in relation to the river, was peculiarly advantageous for the cheap development of electrical power to be used on the operation of all structures, the lighting of the canal and, if practical, the introduction of cable or some other system of towing vessels of full size (about 2,000 tons) safely and expeditiously through without using their own power. The point selected for the power station was at the crossing of the Rivière-la-Graisse on the south bank of the canal. The site had several advantages. It was only 600 feet from the St. Lawrence and the surface of the canal was 20 feet above that of the river. It was calculated that only 10 per cent of a moderate flow through the prism at this place would yield between 500 and 1,000 horsepower. When completed and opened to navigation in October 1899, the Soulanges Canal overcame about two-fifths of the entire lockage between Montreal and Kingston – the average lift lock being more than twice that which obtained on the other river canals.[52]

As soon as it was open to navigation, the canal was a huge success. Along its whole length on the north side, closed arc lamps of 2,000 candlepower were placed 480 feet apart while at the locks and entrance piers they were much closer and on both sides. The result was that the canal was easily navigable by night thereby practically doubling the carrying capacity of this important link in the St. Lawrence navigation. The electrical operation of the entire canal proved completely successful and expeditious; the passage through the whole canal and its five locks, 14 miles, required only 2 hours and 25 minutes. Moreover, at the same time as the canal was opened to navigation, a new system of grain traffic came into operation, that is, large lake boats laden with grain for export put in at Depot Harbour on Georgian Bay; the cargo was then transhipped over the line of the Canada Atlantic Railway to Coteau Landing at the head of the Soulanges Canal, and thence by barge to Montreal. In the season of 1899 the total freight carried by this route to Montreal totalled 309,573 tons, of which 259,531 tons were grain.[53]

Prior to 1914 the need for electrical power led to the construction of power projects on the Soulanges section of the St. Lawrence extending from the foot of Lake St. Francis to the head of Lake St. Louis, a total distance of 18 miles. The oldest of these was the St. Timothée plant of the Canadian Light and Power Company with an installed capacity of 28,800 horsepower. This plant was brought into operation in 1911. It drew water from the abandoned Beauharnois navigation canal and operated under a head of about 50 feet. The Cedars Rapids plant of the Quebec Hydro-Electric Commission was the next one to be put into operation in 1914. This powerhouse was located on the north shore of the river at the foot of the Cedar Rapids. An agreement with the Canadian government allowed the plant the use of 56,000 cubic feet per second in perpetuity which could be increased to 75,000 c.f.s. during the non-navigation season.[54]

iv

Yet another of the projects undertaken at this time to improve the St. Lawrence-Great Lakes navigation was the construction of the Murray Canal extending through the Isthmus of Murray and affording a connection westward between the headwaters of the Bay of Quinte and Lake Ontario, thereby enabling vessels to avoid the open lake navigation. Construction of the canal required that a 4½ mile long cut be made through the isthmus along with extensive dredging and erection of piers in order to form the entrance channels at either end. When completed the canal was practically a "strait" or channel without locks. From the western terminus near the village of Brighton on the harbour of Presqu'Ile on Lake Ontario, the future western terminus of river navigation to Port Dalhousie, the entrance to the Welland Canal, the distance was slightly less than 120 miles. A contract was entered into on 24 August 1882, for the construction of the canal with a length of 5⅙ miles between eastern and western pier heads, 80 feet wide at bottom across the isthmus and with a depth at low water of 12½ feet. According to the contract the canal was to be completed by 1 June 1885, but the work was actually not finished until August 1889.[55] Traffic through the canal during the 1894 navigation season totalled 21,885 tons of which 8,360 tons were produce of the forest.[56]

Throughout the 1890s the Lachine Canal was being continually improved. Such improvements consisted of (a) the construction of a large regulating weir to permit a great quantity of water being introduced into the canal in order to keep the upper reaches at the proper level, and (b) the deepening for a 14-foot navigation between St. Gabriel and Lachine locks, a distance of 6⅕ miles. The contract for the deepening of the prism of the canal to 15 feet was awarded in September 1894, the work being carried on night and day during the season of navigation until it was completed at the end of April 1899.[57]

v

It has already been pointed out that, in order to make the St. Lawrence navigable by vessels of the same class as passed through the Welland Canal and to carry out the general scheme of enlargement adopted by the government, work was commenced on the Cornwall Canal in 1876 – a canal originally designed and constructed to allow vessels to surmount the Long Sault Rapids extending from Cornwall to Dickinson's Landing, a distance of 11½ miles with a rise of 48 feet. The original channel was now deepened, widened and straightened; the embankments were improved, and enlarged locks were built 270 feet long by 45 feet wide with not less than 14 feet depth of water on the mitre sills when the river was at its lowest stage. In order to facilitate construction, the canal was divided into nine sections. Work was commenced with section I at the lower eastern entrance in 1876 and was finished in 1882. Work was done next on section X commencing in 1884 and being completed in 1895. Work to complete the upper entrance, consisting in the extending, strengthening and widening of the channel of the north or landward side of the present entrance from deep water west of the upper gates for a distance of about 3,500 feet, was let under contract in September 1899 to be completed in November 1900.[58] At the same time the old locks were kept in a state of good repair so that they could be used in case of accident to the new ones by the class of vessels hitherto employed on the St. Lawrence.[59] Improvements on the Cornwall Canal were finally completed in 1905 with the installation of electrically driven winches for hauling vessels through the locks.[60]

Meanwhile work was progressing with the entire enlargement of the St.

Lawrence canals to the 14-foot depth, though this was not finally attained until 1904. Farran's Point Canal, situated about 5 miles west of the village of Dickinson's Landing, the head of the Cornwall Canal, was built to overcome the short swift rapid above the village of Farran's Point and was about three-fourths of a mile long with a lockage of 3½ feet. It was first opened to traffic in 1847 for 9 feet navigation. Enlargement having been authorized, a contract was entered into in June 1897 to undertake the work which consisted of forming a new eastern or lower entrance north of the original and free from the eddies produced by the rapids. A new flotilla lock 800 feet long and 50 feet wide with 14 feet of water on the sill at the lowest known stage of the river was constructed (extending from deep water at its eastern entrance to a point 200 feet west of the old lock and nearly parallel to it on the north side). Also the old channel was deepened and straightened to the head of the old canal and extended through Point Avoyon to Empey's Bay. The old lock was kept in good repair so that it could be used in case of accident to the new lock, which was ready for traffic in September 1899 and immediately used by all heavy draught vessels. Dredging of the canal channel resulted in more than 14 feet depth of water being available at the lowest stage of the river.[61]

In November, 1888, a contract was let for the widening and deepening of the upper entrance of the Galops Canal and for the construction of a lift lock from the river below the Galops Rapids about 4,000 feet from the upper entrance together with a guard lock and supply weir to the canal adjacent to that point. Both locks were completed and the water admitted to them in October 1894. By the use of this new lift lock, vessels able to stem the currents of the Iroquois and Cardinal rapids could dispense with about 7 miles of canal passage traversing only the 4,000 feet between the lock and the upper entrance in order to pass the Galops Rapids. As a result no steps were taken toward the enlargement of the 7 miles of canal east of the lock. In the river opposite the canal the formation of a new channel through certain areas in the Galops Rapids was completed in 1888. The improved channel was 3,300 feet long and 200 feet wide, the intention of the government in creating the new channel being to afford a safe passage to a low stage of the river water for vessels drawing 14 feet. Since it was considered advisable to allow a clear margin of 3 feet below the keel of a vessel of this draught, the channel had a depth of 17 feet.[62] One further word about improvement of the Galops Rapids. In 1904 a dam was built with an extreme length of 900 feet and a maximum depth of 17 feet in what was known as "The Gut" between the Canadian Adams Island and the American Les Galops Island. The primary object of the dam was to shut off a side or cross-current in the Galops Rapids and thereby render that channel safer for the passage of vessels. A secondary object was to raise the water in the upper entrance of the Galops Canal by lessening the cross-sectional area of discharge of the river. The depth of water on the sill of lock 27 at its lowest known stage was only 13 feet. The objects of the dam were attained when the current crossing the Galops Rapids channel was overcome and the water in the upper entrance of the Galops Canal was raised.[63]

The Rapide Plat Canal enabled vessels ascending the river to pass the rapids at that place. Descending vessels ran the rapids safely. Improvement of the Rapide Plat Canal consisted of the enlargement of the channel way above, and for some distance below, the existing guard lock at the head of the canal. A new guard lock was constructed along with a supply weir in connection with the old lock. The bottom of the channel, for a distance of about 1,000 feet below, and out about 700 feet into deep water above the lock, was excavated to afford a navigable depth of 14 feet. The new lock was completed in 1888. In January, 1891, contracts were awarded for the enlargement of the remaining portion of the canal, including the lock at the lower outlet.[64]

VI

The turn of the century found a large immigration pouring into western Canada, cultivating vast areas of wheat lands, resulting in an immense increase in the western grain crop. Realizing that the shipment of western grain was the most urgent transportation problem of the day, the federal government set up a royal commission to make "an investigation of questions affecting the transportation of Canadian products to the markets of the world through and by Canadian ports with the view of ascertaining as far as possible the best means of placing such products in a position to compete successfully through all Canadian channels with the products and exports of other countries."[65] The bulk of the western grain poured by way of the railways from the place of production through the elevators at the Lakehead, then eastward through the Great Lakes to ports convenient for export trade. To grain passing eastward through Sault Ste. Marie the problem was one of providing the cheapest, quickest and best route or routes from the elevated Great Lakes system to ocean navigation.

At this time Depot Harbour and Midland were the principal ports on Georgian Bay. Established by the railway companies in order to afford a convenient and short rail route to Montreal – the Canada Atlantic Railway running from Depot Harbour and the Grand Trunk Railway from Midland – a large movement of grain passed through these ports along the increasingly important route by way of Georgian Bay. When testifying before the royal commission, C. M. Hayes, general manager of the Grand Trunk Railway, stated in reference to the Midland route: "The grain comes directly down by our Midland Railway and comes into the Grand Trunk at Belleville, thence to Montreal. Our plans are for the reduction of our grades from Midland to what is our present standard .04 per cent (at present 1 per cent is the maximum) and to double track the line to our main line at Port Hope."[66] Improvement of grade and roadbed would enable the moving of not less than 40,000 bushels in a train load.

One of the great weaknesses of this Georgian Bay route was its want of sufficient elevator accommodation. At the same time of year as the western grain crop was being moved to the seaboard, the railways operating from the Georgian Bay ports were also moving large quantities of general merchandise, as well as United States grain, and, partly because of this traffic, the railways did not move forward the western grain as rapidly as was necessary in order to prevent congestion. The royal commission studying this whole problem therefore strongly recommended that a competent board of engineers be appointed to lay out the harbours of both Depot Harbour and Midland on a broad comprehensive plan, and also that the government undertake the construction of a system of elevators at each of the ports so as to provide proper storage capacity at each place for at least 10 million bushels.[67]

II

By the all-water route via the Welland and the St. Lawrence canal system the distance between Fort William and Montreal was 1,220 miles. Vessels carrying up to 70,000 bushels of wheat could pass through the Welland Canal with its locks 270 feet long, 43 feet wide and 14 feet deep, but larger vessels drawing more water had to discharge at Port Colborne on Lake Erie the surplus of their cargo above 70,000 bushels either in lighters or into freight cars of the Grand Trunk Railway for transportation by rail. The lighters passed through the Welland and their cargo was loaded into vessels at Port Dalhousie on Lake Ontario, going then to Kingston or Prescott where the surplus was again discharged into lighters and the remainder carried through to Montreal on original vessels, stored or discharged into other craft at Kingston or Prescott. The commission strongly recommended the speedy completion of the 2-million-bushel elevator at Port Colborne along with other improvements at that port. The commission recommended the enlargement and deepening of the Welland Canal to the standard of the Sault Ste. Marie Canal, thereby enabling vessels of the largest size to continue their voyage to Kingston or Prescott and thus bring their cargo within 180 miles or less of Montreal before discharging it. Such an enlargement of the Welland was urged upon the commission by those private interests at Kingston engaged in providing excellent facilities for the transhipment business. They wished to see the large vessels plying on the upper lakes proceeding direct to Kingston with cargo intact without being obliged to discharge a portion or all of it at Port Colborne.

III

A matter which gave the commission much concern was the necessity of extending open navigation in Lake Superior and in particular the harbours of Sault Ste. Marie, Port Arthur and Fort William. Boards of trade, including those of Winnipeg, Fort William and Port Arthur, addressed the commission on this subject urging that a powerful and properly equipped ice-breaker capable of overcoming two to three and one-half feet thickness of ice should be supplied by the Canadian government. It was proposed that such a vessel should accompany the first upward bound vessels in the spring from Sault Ste. Marie to Thunder Bay, that the vessel might be utilized by the marine or public works departments during the summer season, and that in the late fall the vessel could perform the service of any ice-breaker required at Thunder Bay prior to its return to Sault Ste. Marie. The commission believed that, due to the date of the harvesting and shipment of western grain, any lengthening of the period of fall navigation at the Lakehead was a matter of great importance from both a national and western standpoint. At the same time the flow of immigration into western Canada along with the movement of enormous quantities of merchandise westward necessitated the earliest possible opening date in the spring navigation in Lake Superior.

Every day gained in the delivery of this freight was crucial to the economy of western Canada. At that time recorded dates of the opening and closing of navigation at these places showed that the season of navigation at Sault Ste. Marie under existing circumstances was longer than at the Lakehead by an average of 19 days. Regarding the paramount importance of an extended seasonal navigation, T. C. Keefer, in his presidential address to the Royal Society of Canada in 1898 on winter navigation declared, "The early closing of the St. Lawrence has been given as the reason why 75 per cent of our Manitoba wheat was exported from New York last year and only 25 per cent from Montreal. Whether this is correct or not, there can be no difference of opinion as to the importance to Canada of an extension of the length of the season of navigation if only for one month and also of the value of the earliest possible reopening of navigation in the spring which would follow a diminished ice-pack."[68]

In conclusion the commission recommended a uniform standard depth of water of 23 feet in all harbours and waterways in connection with the Great Lakes down as far as the foot of Lake Erie and that such portions of the harbours of Port Arthur, Fort William, Depot Harbour, Midland and Port Colborne as were required for present use should be immediately deepened to that standard.

iv

When discussing the port of Midland the commission suggested that it should serve also as the port for the Trent River navigation upon which the dominion government had already expended upwards of $6 million. The commission recommended that this waterway be completed as soon as possible by way of the Severn River at the Georgian Bay end and the Trent River on the Bay of Quinte so that its terminals would lie in protected waters for the greater safety of the smaller boats and barges to be used along this route. The term "Trent River navigation" was applied to the several water stretches lying for the most part along the valley of the Trent River between the Bay of Quinte on Lake Ontario and Georgian Bay on Lake Huron. The idea was to form a continuous line of landlocked navigation between the two lakes by connecting the several water stretches by short canals. The route contemplated ran along the Trent River, Rice Lake, Otonabee River and Lakes Clear, Buckhorn, Chemong, Pigeon, Sturgeon and Cameron to Balsam Lake, to summit water being about 165 miles from Trenton. Then from Balsam Lake by a canal and the Talbot River to Lake Simcoe; thence by the Severn River to Georgian Bay on Lake Huron. The total distance was about 235 miles requiring the construction of only 20 miles of artificial waterway.

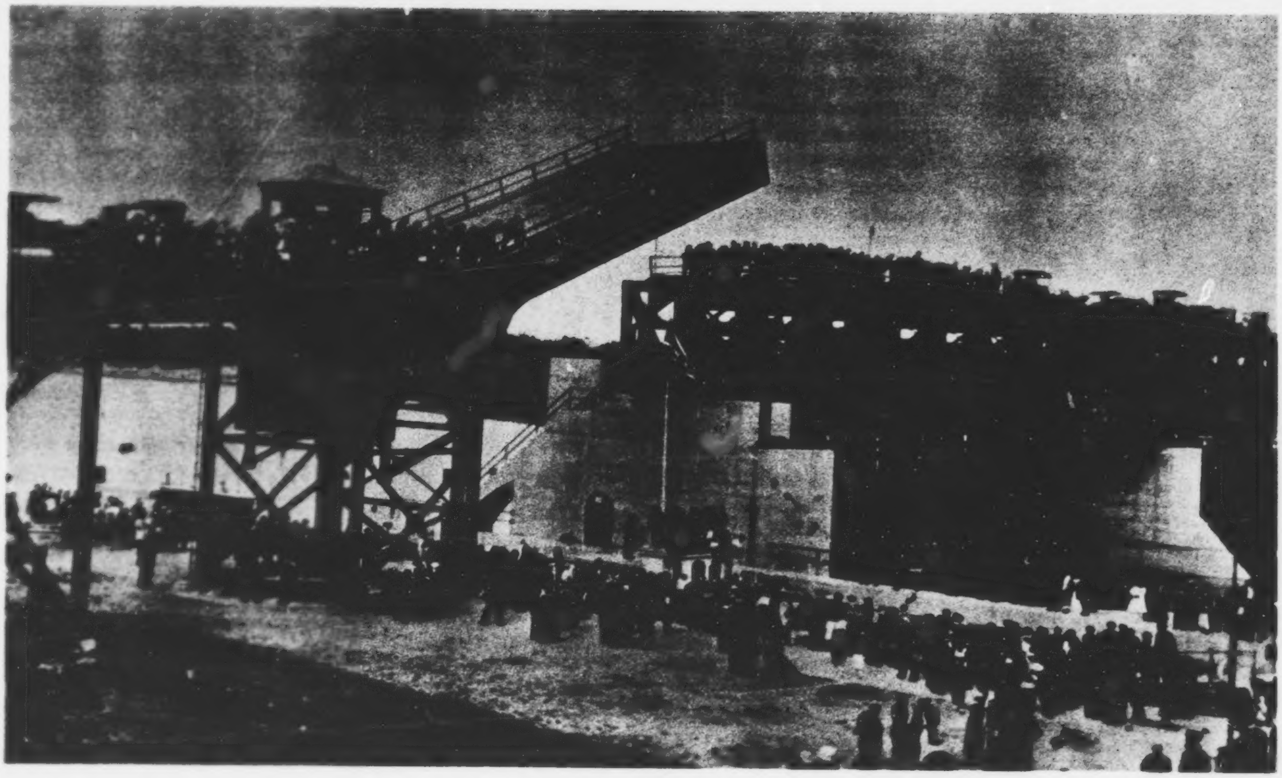
We have already noted that as early as 1835 the imperial government chose this route as affording the most natural and feasible along which to make a water communication between the two lakes, and that the provincial government voted money to construct part of the work but that the scheme was subsequently deferred. However, a few works were built and some sections made practicable for local navigation and the passage of timber. The following figures indicate the distance of navigable and unnavigable reaches in 1893, a decade before the Royal Commission on Transportation commenced its inquiry.[69]

	Navigable Miles	Unnavigable Miles
From Trenton, Bay of Quinte, to Nine Mile Rapids		9
From Nine Mile Rapids to Percy Landing	19½	
From Percy Landing to Heeley's Fall dam		14½
From Heeley's Fall dam to Peterborough	51¾	
From Peterborough to Lakefield		9½
From Lakefield to a point across Balsam Lake	61	
	132¼	**33**

The total distance from Bay of Quinte to Balsam Lake was 165 miles. A branch of the main route extended south from Sturgeon Lake, afforded communication with the town of Lindsay and continued through Lake Scugog to Port Perry, 190 miles from Trenton. The branch included 48¾ navigable miles and 27½ unnavigable miles.

The following is a list of the works by which the Trent River navigation was improved by 1900, comprising canals with locks at Burleigh Rapids, Buckhorn Rapids and Fenelon Falls along with dams at Lakefield and Young's Point.[70] These works afforded communication between Lakefield 9½ miles from Peterborough and Balsam Lake, the headwaters of the system, opening up a total of about 160 miles of direct and lateral navigation.

34 St. Andrews Lock, Lockport, Manitoba, about 1910.
(*Public Archives of Canada.*)



Trenton to Balsam Lake:	Miles from Trenton
Chisholm's Rapids: the work here consisted of a canal and lock, a dam and slide	15½
Percy Landing: the work here consisted of a retaining boom for sawn logs	28½
Campbellford: the work here consisted of guide boom	34¾
Middle Falls: the work here consisted of two dams and a slide	37¾
Crow Bay: the work here consisted a retaining boom	38
Heeley's Falls: the work here consisted of a dam and slide	42¾
Crooks Rapids: the work here consisted of one lock, one dam and slide for timber	56½
Whitlas' Rapids: situated below Peterborough, the work here consisted of one lock, one dam and canal	92⅞
Peterborough: the work here consisted of three piers and one boom	94
Lakefield: situated 9½ mi. above Peterborough; here the dam at the head of Nine Mile Rapids of the Otonabee River, completed during 1886-87, maintained navigation on Katchawannoe Lake to Young's Point.	103½
Katchawannoe Lake: the work here consisted of one boom 4 miles long separating navigable and timber channels	108½
Young's Point: situated 5 miles from Lakefield; the work here consisted of one lock and a dam which controlled the water level through Clear and Stony lakes up to the foot of the Burleigh Canal.	
Burleigh Rapids: situated 10 miles from Young's Point; the work here consisted of a canal about 2¼ miles long comprising three lift locks and a few dams and passing the Burleigh and Lovesick rapids thereby giving communication between Stony Lake and Deer Bay.	118
Buckhorn Rapids: situated 7 miles from Burleigh Rapids; the work consisted of a canal, one-quarter mile long, having one lift-lock; a dam at this point kept up the level of the water of the lake west of it as far as Bobcaygeon including Lakes Pigeon, Buckhorn and Chemong.	125
Bobcaygeon: situated 15¾ miles from Buckhorn Rapids; the work here consisted of a dam 553 feet long which controlled the water level up to Fenelon Falls.	140¾
Fenelon Falls: situated 15 miles above Bobcaygeon; the work here consisted of a canal, one-third mile long with two lift-locks, constructed in 1885, and connecting Sturgeon Lake with Cameron Lake.	154¾
Rosedale: the work here consisted of one lock giving entrance from Cameron's Lake to Balsam Lake.	162¾
Branch from Sturgeon Lake to Lake Scugog: *Lindsay:* work here consisted of one lock built by the Ontario government in 1879.	161¼
The navigation is, by this work, extended to Port Perry on Lake Scugog.	190

All the above-mentioned locks were 134 feet long by 33 feet wide with a depth of 5 feet on the mitre sills.

By the turn of the century new construction was under way to make a continuous line of navigation between Heeley's Falls and the ports on Lake Simcoe, a distance of about 160 miles.[71] Provision was also made for an eventual draught of eight feet along this new section of navigation. For many years a continual subject of complaint was the management of water in the different regions during the dry season.[72] At the time the regulation of water was under three different managements: the federal government, the provincial government and private industry. The immense country drained and becoming every year more cleared created increasing difficulty in the proper regulation of the water which was running off more rapidly in the spring with few dams to conserve it. Around Peterborough the regulation of water was most unsatisfactory owing to the mills at Young's Point, Lakefield, using all the surplus.[73] Any temporary stoppage in the mills greatly reduced the entire flow in consequence of which the mills located below Peterborough often had to cease operation for a time. Hence negotiations were opened between the federal and provincial governments for the transferral of the several dams (over 50 controlling some 70,000 acres of water in which over 25 billion cubic feet of water could be stored) from the province to the dominion. These dams to some extent controlled the water in the north country and it was proposed to extend the system for the benefit not only of the navigation of the Trent waterway but also of the commercial interests located along it. Finally in 1905, under an order in council, various lakes and 50 dams were taken over by the federal government of which 36 were constructed of concrete and the remainder of timber.[74]

Traffic on the Trent waterway nearly doubled during the decade of the nineties, the total number of lockages increasing from 2,500 in 1893 to 5,442 in 1903.[75] However, this did not fairly represent the traffic on the waterways as, owing to many of the longer routes of the steamers not passing through the locks, no record of the traffic was kept. There were at the turn of the century over 30 vessels engaged in commerce between Lakefield and Balsam Lake besides a large number of small steamers belonging to private individuals. There were also several steamers on the reach between Peterborough and Heeley's Falls and several on Lake Simcoe. Many of the larger steamers were of considerable size, some of them carrying as many as 450 passengers.

Meanwhile improvement of the Trent waterway continued. A new hydraulic lift lock near Peterborough was formally opened for traffic in June 1904.[76] The occasion was one of considerable interest especially from an engineering point of view. The lock in a single operation raised or lowered a vessel of the ordinary type, 800 tons capacity, used on the canal, a distance of 65 feet in three minutes actual movement. Not only was it the only lock of its kind in North America but it was double the size of any of the three existing in Europe. In 1911 a new electric lighting system was installed at the Peterborough hydraulic lift lock.[77] This not only greatly improved the appearance of the lock but made it possible to pass boats through after dark.

During the session of 1907 the government decided upon a through water route from Trenton, on the Bay of Quinte, to Rice Lake by the Trent River and voted a sum of $700,000 to begin the work.[78] Construction was begun that fall. The work carried out on the principle of damming the river at suitable points by means of dams and connecting the pools thus created by means of locks. These were 175 feet long by 33 feet wide with 8 feet 4 inches of water on the sills and in the reaches a minimum depth of 9 feet of water. The 58 miles of river had a fall of 369 feet between Rice Lake and Trenton.[79]

By 1914, therefore, the Trent navigation had been greatly improved by the construction of short canals with locks at Hastings, Peterborough (from Peterborough to Lakefield there were seven locks, one being an hydraulic lift), Young's Point, Burleigh Falls, Lovesick, Buckhorn, Bobcaygeon, Fenelon Falls, Rosedale, and six locks between Balsam and Simcoe, one being an hydraulic lift at Kirkfield formally opened for traffic on 6 July 1907. There were also dams at Heeley's Falls, Hastings, Peterborough, Young's Point, Burleigh, Lovesick, Buckhorn, Bobcaygeon, Fenelon Falls, Rosedale, and three between Balsam and Simcoe lakes.[80] Also by 1914 there was considerable development of hydro-electric power along this waterway. The Sidney Electric Power Company constructed hydro-electric plants at the west end of Dam No. 2 on section 1 of the Lake Ontario-Rice Lake division and at the rear of dam No. 5 on section 2 of the same division.[81] The company also built a transformer station which was used as a distributing point for all power generated between Trenton and Frankford. Here the current was stepped up from 6,600 volts delivered from the power house to 44,000 volts for transmission to various parts of the country.[82] The Seymour Power and Electric Company had a generating plant at dam No. 11 on section 5 of the same Lake Ontario-Rice Lake division,[83] while the Campbellford municipal electric plant was located at dam No. 12.[84]

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The Royal Commission on Transportation reported in 1905 that one of the Canadian routes which merited serious consideration as a possible artery by which the products of the West could reach ocean navigation was an all-water route from Georgian Bay down the Ottawa River to Montreal. This scheme had been proposed many years before and was again revived at the turn of the century. In 1899 and 1900, under special appropriations voted by Parliament, surveys were conducted on the upper Ottawa with a view to ascertaining the feasibility and probable cost of constructing a canal system which would give a 14-foot navigation along such a route.[85] A special report on the proposed Montreal, Ottawa and Georgian Bay canal dated 21 March 1901 from the engineer in charge, H. A. F. MacLeod, contained an estimate of the cost of the proposed waterway.[86] MacLeod based the estimate on (a) the surveys and estimates of cost made in 1859-60 for a route which left the Allumette Lakes at the head of Allumette Island and passed down the Culbute channel through Coulonge Lake and the Rocher Fendu channel, (b) a recent survey of the summit section from Talon Lake to Nipissing Lake, along with (c) a recent description of work to be done and estimate of cost prepared by H. G. Stanton, for a 14-foot navigation between Lake St. Louis and Ottawa. MacLeod's estimate was for 14 feet navigation with 16 feet in the open reaches and with two sets of combined locks to be constructed at a cost of $23,898,000, and for a 20-foot navigation the cost would be $72,627,000. The distance from Georgian Bay to Montreal by this route would be 430 miles.

Though railway development after 1900 seemed to lessen the urgent need of the Georgian Bay Canal, the enormous pressure of the grain traffic on transportation facilities led to periodic revivals of agitation for building it which would shorten the distance between Montreal and Sault Ste. Marie by about one-half as compared with the Welland route. In 1904 Parliament provided an appropriation for yet another survey of the route. The report of this survey submitted in 1909, stated that a 22-foot waterway covering the 440 miles between Montreal and Georgian Bay could be constructed with 27 locks at a cost of $100 million.[87] Following this report nothing further was done except to construct storage works on the upper Ottawa to regulate the flow of the river for power development purposes. The tremendous cost of the undertaking and the time that would be consumed by vessels in passing through the locks were serious drawbacks to the accomplishment of this project.

VI

The Washington Conference in 1871 found Great Britain and the United States discussing the reciprocal use of Canadian and American canals. On 18 March 1871 the American commissioners proposed that Canadian and American vessels should have equality of treatment in these canals.[88] The British commissioners replied, however, that the privilege of using the Canadian canals was a much greater concession to the Americans than the privilege of using the American canals was to the Canadians. Thereupon the Americans suggested that Canada concede the navigation of the St. Lawrence and the use of the Canadian canals and in return the United States would give to Canadians the navigation of Lake Michigan and the use of the canals in the United States. But the British commissioners declined this proposal. They suggested, instead, the same arrangement with regard to the canals and added as a part of the bargain "a reciprocal agreement as to transit and transshipment" and a pledge by Canada not to impose export duties on logs floated down the St. John River for shipment to the United States. The American commissioners assented to this but they desired further and it was agreed "that the transshipment arrangement should be made dependent upon the non-existence of discriminatory tolls on the Canadian canals."[89] By Article XXVII of the Treaty of Washington, Great Britain and the United States respectively agreed to urge on Canada and on the separate states concerned to accord navigation of their canals on terms of mutual equality to the people of both countries.[90] That compact was honourably kept by Great Britain and Canada whose canal policy was in no way antagonistic to the letter or spirit of the Treaty of Washington. American barges took Canadian lumber from Ottawa, through the Ottawa River and Chambly canals, for the markets of New York and returned with American coal for Canadian consumption.[91] They used these canals on exactly the same terms as barges of Canadian registry. Unfortunately the compact made was not kept by the United States. No Canadian boat or barge was permitted to carry Canadian lumber to the markets of Troy and Albany or bring American coal for Canadian use through any of the New York canals.[92] So much for Article XXVII of the Treaty of Washington.

Article XXX of the treaty pertained to reciprocal agreement as to transit and transhipment. According to this article Canadian vessels could carry goods from an American port to a Canadian port; those goods could be hauled by rail to another Canadian port and shipped from there in a Canadian vessel to an American port. Added to Article XXX was the clause, insisted upon by the American commissioners, declaring that this transit business should be stopped if canal toll discrimination should be resorted to by Canada.[93] No discrimination was practiced or charged but the transit trade grew to such proportions as to attract attention. Whereupon the United States gave notice of its desire to secure the abrogation of Article XXX, and abrogated it was in 1885.[94] Thus the equivalent for the free use of the canals, which permitted the transportation of grain from Duluth to Collingwood, and from Collingwood to Toronto and thence to Ogdensburg, was withdrawn.

Prior to 1883 tolls were paid by shipping on the St. Lawrence and Great Lakes and also on the Erie Canal. In that year, however, tolls on the latter were abolished. The natural consequence of the action was that more lake traffic tended to flow to New York by this route. To counter this development tolls on grain passing through the Welland Canal were halved in 1884 upon the urgent requests of forwarders and other groups interested in the grain trade. Before 1884 tolls on grain for passage through the Welland were 20 cents a ton. In the following year, 1885, tolls were further reduced to 2 cents a ton and this rate prevailed up to 1892. That year witnessed another reduction to 2 cents a ton on grain passing down the Welland and St. Lawrence canals and exported, and in such cases only. An order in council, dated 13 February 1893, reduced tolls to 10 cents a ton on grain passing westward through the Welland irrespective of destination, and the same rate of toll was allowed by succeeding orders in council up to and including the year 1900. At this time the rate through the St. Lawrence canal only was 10 cents a ton but goods having paid full toll on the Welland were allowed to pass down the St. Lawrence to Montreal free from payment of any further toll.[95] Such progressive reductions in tolls resulted in marked increase in traffic.

Renewed requests of forwarders and shippers of Montreal, along with the management of the Canada Atlantic Railway Company, for a reduction of tolls on certain agricultural products, resulted in the passage of an order in council, dated 3 May 1901, authorizing a reduction as follows:

> *For the season 1901 the canal tolls for the passage of the following food products, wheat, indian corn, pease, barley, rye, oats, flax-seed and buckwheat for through passage eastward through the Welland Canal, shall be 10 cents per ton, and for through passage eastward through the St. Lawrence Canals, only 10 cents per ton, payment of the said toll of 10 cents per ton for passage through the Welland Canal to entitle these products [illegible] free passage through the St. Lawrence Canals, or any portion thereof; further, in the case of any of the above named products brought down from Parry Sound over the line of the Canada Atlantic Railway Company to their elevator at Coteau Landing, the through rate thereon from that point to Montreal, to be 2½ cents per ton.*[96]

Finally, in 1904, tolls were abolished on the St. Lawrence-Great Lakes route, and all shipping was free to use the Canadian or United States locks at Sault Ste. Marie without fee of any kind.[97]

In 1909 a treaty was signed between Canada and the United States regarding "boundary waters" extending between the two countries. By this treaty both countries could use the waterways. Tolls might be imposed if thought desirable but only without discrimination as to nationality. Accordingly, if either country desired to abandon the system of toll-free canals, it would have to impose tolls on its own shipping. In accordance with the provisions of the treaty, the International Joint Commission was created in 1911 as a permanent commission to deal with the lease, obstruction or division of boundary waters.

VII

The report of the Department of Railways and Canals for 1902 contains some interesting statistics relating to the competition between Canadian canals and railways for the transport of western grain. In that year 151,566 tons of grain and peas passed down to Montreal through the Welland and St. Lawrence canals, a decrease of 93,095 tons compared with the previous year. At the same time the Canadian Pacific and Grand Trunk railways carried 227,700 tons, a decrease of 1,924 tons compared with the previous year. Over the route from Depot Harbour, on Georgian Bay via the Canada Atlantic Railway to Coteau Landing at the head of the Soulanges Canal, thence by barge to Montreal, in the season of 1900, the total freight carried to Montreal was 319,865 tons, of which 303,259 tons were grain. In the following season 321,016 tons were carried of which 291,834 tons were grain. Of the grain so carried in 1900, 126,963 tons were wheat and 154,815 corn; and in 1901, 207,403 tons were wheat and 71,459 corn.[98]

A glance at statistics relating to traffic on the New York state canals and railways for the year 1901 shows that the quantity of grain carried to tidewater on the canals was 355,760 tons, an increase of 46,815 tons over the previous year while the quantity carried by the railways to tidewater amounted to 4,630,479 tons, an increase of 234,038 tons.[99]

By 1907 the growing importance of water transport in Canada was clearly shown. In that year the quantity of freight carried on the dominion canals was 20,543,639 tons, an increase over the previous year of 10,020,459 tons, or 95.2 per cent. Most of this addition was largely at the Canadian Sault Ste. Marie Canal where the 6,574,039 tons of 1906 were increased to 15,588,165 tons, in 1907. Through the Welland Canal from points west of it there passed down to Montreal 789,167 tons as against 479,442 tons in 1906; of this 635,573 tons were grain. One hundred and two Canadian and fourteen American vessels took their grain cargoes, 5,168,796 tons, to Montreal without transhipment in 1906. Down the Welland there passed 840,890 tons of grain to Kingston and Prescott.[100] The two major railways, Canadian Pacific and Grand Trunk, carried to Montreal 383,735 tons of grain, a decrease as compared with the previous year of 3,228 tons.[101] It was clear that the use of water transport for certain classes of commodities, where it was available, was becoming more commercially desirable. But water transport offered more than the mere conveyance of goods. It controlled and restricted freight charges as against its competitor, the railway. Producer, consumer, and the several interests lying between them, all profited by this control.

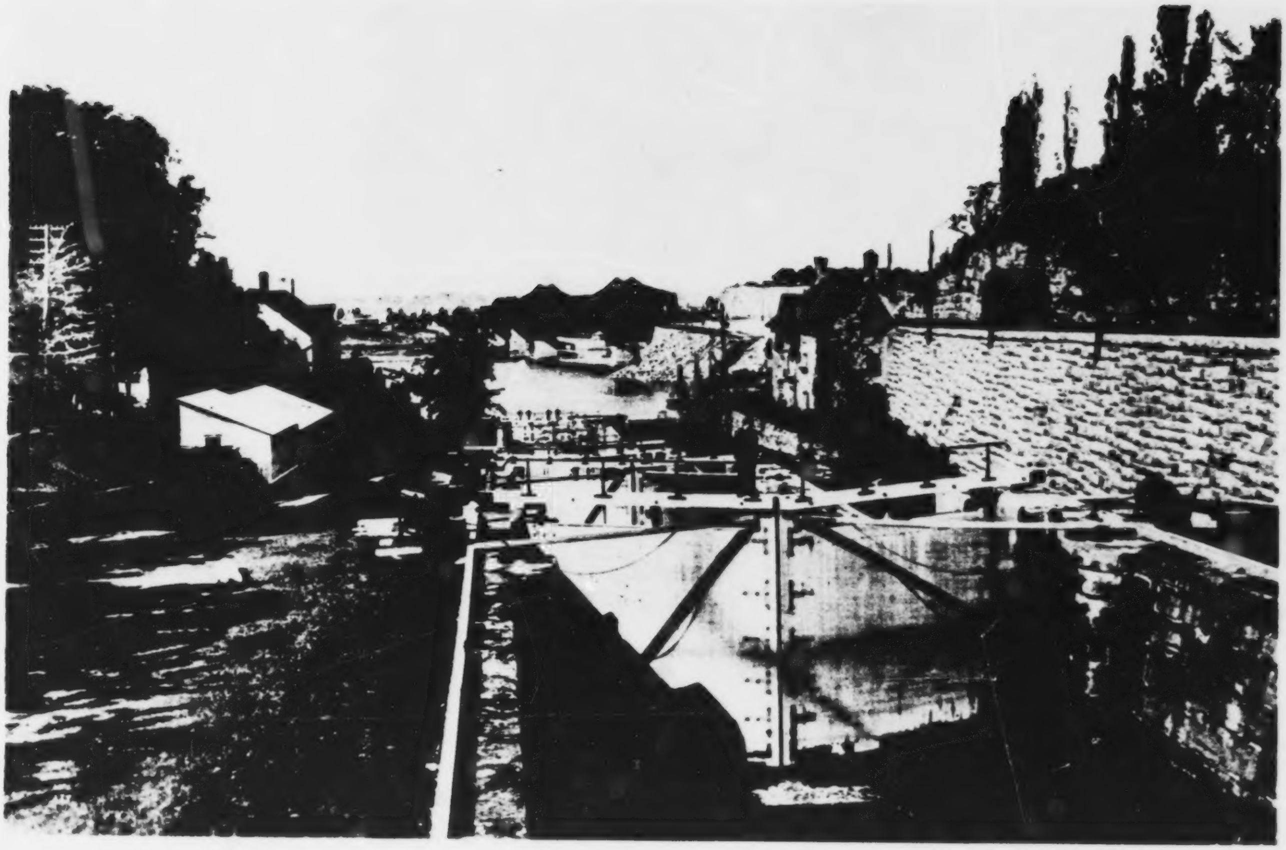
Suggestive of the awakened interest of Canadian enterprise in the problem of water communication from the Great Lakes to tidewater at Montreal was the statement, made by the superintending engineer to the Soulanges Canal in his report for 1902, to the effect that there were then building at various points on the upper lakes and under contract for delivery in 1903, ten steel freight steamers of full canal size, 255 feet in length overall, 241-foot keel, 44-foot beam and 18 feet in depth to be fitted with triple expansion engines. It was estimated that they could carry 2,200 tons of cargo on a 14-foot draught.[102] The revival and expansion, at this time, of the Canadian ship building industry, long dormant on the Great Lakes, was a highly gratifying development. Heretofore the United States, England and Scotland supplied the vast fleet of steel vessels plying these waters. Now, however, Canadian shipyards, notably those of Collingwood on Georgian Bay, commenced building large vessels adapted for carrying 200,000 to 300,000 bushels of wheat.[103] Such shipbuilding is not surprising since, by the beginning of the 20th century, three great classes of freight – ore, coal and grain – were shipped in bulk on the Great Lakes.[104] The ore traffic, the greatest of the three main classes, moved eastward from the Duluth area at the head of Lake Superior down to ports on Lakes Michigan and Erie. Much of it was used at the ports of destination but some of it was subsequently shipped further inland by rail to centres of the iron and steel industries. The ore traffic accounted for about 67 per cent of the traffic at Sault Ste. Marie. Most of this traffic passed down to the Lake Ontario area by water. Next, but with the flow reversed, was the coal traffic, the bulk of which reached water at Lake Erie ports and proceeded northwest to the head of Lake Superior. Some 17 per cent of the traffic passing through Sault Ste. Marie was made up of this class. The grain traffic constituted about 11 per cent of the tonnage passing through the locks at the Sault. These forms of bulk traffic were responsible for unusual port and shipping developments. The vessels which this traffic produced were unique – boats steadily increasing in size; the largest with a length of over 600 feet, a beam of 64 feet and a designated draught of 21 feet.[105] These vessels moved the large bulk cargoes of grain and ore eastward and the return trip when possible was made with coal. Whereas the ore and coal trade were local, a very large part of the grain traffic was for destinations overseas and the problem was how best to get it down to ocean ports from the producing areas, from the lake terminals to the Atlantic ports, principally Montreal and New York. Montreal had the advantage of a through route by water from the head of the lakes at the eastern end of which the large cargoes had to be transferred to smaller boats or rail to proceed to Montreal. Waterborne traffic, therefore, shrunk between Lake Erie and Montreal. Clearly more traffic destined for export would have continued down to Montreal by water if only the waterway could have been enlarged to accommodate the large bulk freighter.

VIII

Because of the bulk freighter and the fact that increased traffic would likely flow further east in such vessels if facilities allowed, starting in 1907 the question of enlarging the Welland Canal was raised by many interests including practical businessmen composing boards of trade in important cities from Halifax to Vancouver. These men were fully acquainted with the immediate conditions of traffic on the lakes and, foreseeing a rapid expansion in trade and commerce between the east and fast growing west, urged that better means of water communication be provided beween Lake Superior and Lake Ontario. In all 27 boards of trade and other commercial bodies, including the Dominion Marine Association and the Grain Produce Exchange of Winnipeg, sent resolutions urging enlargement of the Welland to the Department of Railways and Canals. The following extract from these resolutions shows the attitude of the applicants.

> *The enlargement and improvement of the Welland Canal is a matter of the most urgent importance to Canada, both as a means of reducing the cost of transportation of grain and other export products from the interior to tide-water, and also as a means of making the St. Lawrence route the highway which it should be, not only for the export commerce of the Dominion, but also for that of the control and northern portion of the United States.*
>
> *That at present the route from the head of the lake to the sea board via Buffalo and New York enjoys a great advantage in the cheapness with which grain can be carried from western lake ports to Buffalo, in large vessels of 10,000 tons and over; that advantage will be further increased by the enlargement of the Erie canal which has been undertaken whereby barges of 1,000 tons will replace those of 250 tons now in use on the second portion of this route; and that under existing conditions the Canadian route via the Welland canal cannot possibly compete with that via Buffalo and New York, even if Port Colborne harbour is improved so as to provide the same facilities for storage and transhipment as are now available at Buffalo, because additional difficulties and expenses are entailed in providing for the navigation of the second part of the route, which includes, with the Welland canal and the St. Lawrence,*

35 Locks on the Rideau Canal at the Ottawa end, about 1914. Note the curved floor of the lock in the foreground. (*Public Archives of Canada.*)



the broad exposed waters of Lake Ontario. That on the other hand if the Welland canal is enlarged and approved so as to permit these large vessels of the upper lakes to extend their voyages to the full length of deep water at or below the foot of Lake Ontario, the longer haul of the large cargoes in unbroken bulk will place the advantages decidedly on the Canadian route.[106]

At this time the Welland Canal system contained 25 lift locks whose dimensions were 270 feet in length by 45 feet in width with but 14 feet of water on the sills, while the narrow canal prism compelled severe restrictions on speed. Vessels using the Welland Canal were practically restricted to dimensions of 255 feet in length and 44 feet beam. They therefore had a very limited carrying capacity. This gave much concern to the commercial interests which held that to make a remunerative voyage from Lake Superior western ports to Lake Ontario eastern ports, a vessel should be capable of carrying 7,000 to 10,000 tons.[107] Any possible enlargement of the Welland Canal required serious consideration being given to three major factors; (1) the extent of enlargement, (2) the speed of passage through the new enlarged canal and (3) the cost of the work. As to the first point it was essential that an enlarged Welland Canal should at the very least, be able to accommodate the large class of vessel, from 500 to 600 feet in length, then using the Sault Ste. Marie Canal. This meant a depth of water 25 feet in the reaches and not less than 22 feet in the lock gate. It also meant a widening of the canal prism by about two and one-half times its present width and increasing its depth to 25 feet. As to the second point (speed of passage), the multiplicity of lift locks on the Welland Canal was an unavoidable source of great delay in passage through, and it was essential that the number of locks should be as limited as possible. By reducing the number of locks to seven, the normal delays would be partly reduced and passage through the canal could be effected in about seven hours instead of the usual fifteen hours for a loaded vessel of full canal size.[108]

As a result of all these resolutions and discussions regarding the enlargement of the Welland Canal, plans were made during the period 1907-12 for the reconstruction of the canal on lines which it was believed would meet all possible requirements for many years to come.[109] The proposed new canal would follow an entirely new route from Thorold to Lake Ontario by means of a new cutting to be made from Allanburg, crossing the existing canal just below lock 25 and recrossing again below lock 11 with the proposed canal entering Lake Ontario at the mouth of Ten Mile Creek about three miles east of Port Dalhousie, the entrance of the existing canal. Above Thorold, however, the proposed canal followed roughly the route of the existing one, half way across the peninsula, to Port Colborne on Lake Erie. The lift from lake to lake remained, of course, the same as before but was now accomplished, in the proposed new canal, with only seven locks, each having a lift of 46½ feet, instead of 25 locks as in the existing 14-foot canal. The dimensions of the locks were to be 800 feet in length by 80 feet in width in the clear with 30 feet of water over the mitre sills at extreme low stages on the lakes. The width of the canal at bottom would be 200 feet. It was proposed that at first the canal would be excavated to a depth of 25 feet only, but all the structure would be sunk to the 30 foot depth so that the canal could be deepened at any future date by the simple process of dredging out the reaches. Plans of the proposed canal called for the construction of twin locks numbers 4, 5 and 6 in flight. These three locks overcame a descent of 139½ feet. One flight would be used for downbound vessels and the adjoining flight for upbound, a double flight being required to save long delays in the passage of vessels through the canal.

The lock walls will be 82 feet high above the top of the gate sills and including the necessary foundation work required below this level two of the locks will have walls 100 feet high.

The lock gates will be of the single leaf type, swinging on a hinge at one side of the lock, and resting when closed in a notch cut in the opposite wall, a single leaf thus spanning the whole width of the lock chamber. The gate at the foot of said lock will be 83 feet in height and 88 feet in length, and will weigh about 1,100 tons.

The valves and culverts in the walls are of large dimensions and will permit of the lock being filled in less than eight minutes. This will mean that the time of passage through the canal will be much reduced below that required at present.[110]

Work was begun on the Welland Ship Canal in 1913 but, due to the war, construction was suspended in the fall of 1916.

IX

With a view to assisting in the development of trade through the canals as well as the formation of a well-protected harbour at Port Colborne, the Department of Public Works planned in 1904 to carry out extensive harbour improvements. Already completed was the dredging and cleaning up of the bottom of the canal basin along with the entrance harbour to a depth of 16 feet at low water. Excavated also was a wide channel 23 feet in depth from deep water in the lake to the lighthouse situated 2,000 feet from the shore line on the southern end of the west pier and the construction of two elevator docks at this point. Moreover, the department had recently completed a breakwater across the southwest face of the harbour 4,500 feet long and situated on the lake about 1,650 feet south of the new docks. But that was not all. In order to afford protection from easterly storms the department was at the time building a second breakwater 2,400 feet long and beginning 600 feet from the eastern end of the present one.[111]

Previously in 1903 the Royal Commission on Transportation visited the harbour and heard evidence in reference to the works then under contract and contemplated for the improvement of the Welland Canal and Port Colborne Harbour. The commission discussed at length the construction of suitable foundations and elevators of the most modern type and required capacity on the new docks as well as the required rail connection out of the docks.[112]

X

When studying the Richelieu River navigation in 1871, the Royal Commission on Canals concluded that the wisest policy for Canada to follow, in regard to the line of water communication between the lumber yards of Ottawa and the great lumber markets at Troy and Albany in New York state, was to enlarge all the canals on this line of navigation from Ottawa to Lake Champlain to one uniform scale commensurate with that recommended for the Ottawa canals and with which the lock at St. Ours already corresponded.[113] This recommendation, if allowed, necessarily involved the enlargement of the Chambly Canal extending from Chambly basin to St. John, 12 miles with 74 feet of lockage and 9 locks. The cost of such an enlargement was estimated in round numbers at $1.5 million. Once that work was done it was not considered necessary to make improvements on any other part of the Richelieu.

By June, 1896, the total amount expended by the government for original construction and enlargement of the Chambly Canal was $637,206.76 and for the St. Ours lock was $121,537.65.[114] After 1900 traffic increased along this waterway. In 1903, 379,442 tons of freight were moved on the Chambly Canal, an increase of 19,644 tons over the previous year, of which 25,084 tons were produce of the forest and 23,768 tons of coal.[115] In September, 1908, the elecrical lighting of the St. Ours lock and its approaches by arc lamps was inaugurated. This proved to be a great aid to navigation. There were in all ten 2,000 c.p. lamps: four on the lock, two along the lower approach, three on the upper approach, and one on the yard near the shops.[116] In addition to the above, a number of incandescent lamps were placed in the various buildings connected with the canal.[117] The new light was a decided improvement on the old system of oil lamps and greatly facilitated navigation of the lock. In 1910, concrete foundations were laid for the proposed new Chambly Canal power house.[118] At that time the Montreal Light, Heat and Power Company was supplying the canal with the required power under an agreement dated 22 January 1907. However, only the lower section of the canal about two miles in length was electrically lighted, and, in view of the extension of the lighting along the whole length of the line, the foundations of the power house were devised for water power sufficient for the purpose.[119]

Three years later electrical machinery was designed for the operation of the lock gates and sluices at St. Ours.[120] Steel frames and timber top logs were placed on the crest of the dam here in such a manner that both could be removed at will (a movable dam). The purpose of this movable dam was to keep the level of the section of the Richelieu River between St. Ours and the foot of the Chambly Canal about two feet above low water mark. This proved satisfactory and the level of the river was kept up as intended during the period of low water. At the same time as the movable dam was built, four of the old cribwork boom piers on the east side of the lower entrance were removed and rebuilt with concrete laid on pile foundations. In the same year, 1913, the bottom of the Chambly Canal's lock No. 6 was renewed.[121] The old planking was removed and replaced with concrete. The canal's lighting system was remodelled and extended from lock No. 2 to St. Johns. It was decided to adopt incandescent lamps instead of arc lamps as generally used on canals. The power used here was supplied free of charge by the Montreal Light, Heat and Power Company from their Chambly plant. The supply of free power came about as a result of the Chambly Canal power house being carried away during the spring floods in 1908. The unprecedented rise of the Richelieu River at that point that year and the consequent destruction of the canal power house were due to the existence of the Montreal Light, Heat and Power Company's dam some distance below. After protracted negotiations the Department of Railways and Canals secured from the company, among other things, an undertaking to supply in perpetuity to the Chambly Canal, for the loss of its power house, electrical energy equal to 75 h.p. Under a subsequent agreement, dated 9 April 1912, power was to be supplied at the rate of 100 h.p. during the season of navigation and 40 h.p. during the winter months. This power it was expected would be sufficient for the lighting of the canal from one end to the other.[122]

I

By the end of World War I, Canada had been engaged in the construction, operation and periodic enlargement of canals for nearly 100 years and the canals and canalized waters of Canada open to navigation totalled 1,831 miles. Constructed to improve the natural means of communication offered by lakes and rivers, canals antedated the development of railway transport. However, after the 1850s climatic conditions and geographical considerations subordinated water transport to rail. Yet the canals continued to play an essential role in the development of the country, affording for the greater part of the year a comparatively low cost movement of bulk traffic and exerting a moderating influence on rail rates and charges generally. The provision of these canals, their maintenance and operation had, by 1918, cost the dominion between three and four hundred million dollars.[1]

At the conclusion of World War I, the following waterways formed an essential part of Canada's transportation system. First there was the through water route between Montreal, at the head of ocean navigation, and the Lakehead, on the west shore of Lake Superior. This comprised 74 miles of canal with 48 locks, and 1,155 miles of river and lake waters, or a total of 1,229 miles.[2] The minimum dimensions of the locks on the route were: length 270 feet, width 45 feet, depth of water on sills 14 feet. The length of vessel to be accommodated was limited to 255 feet. At Farran's Point, in the canal of that name, the lock was 800 feet long. A similar lock was built at Iroquois on the Galops Canal, the object being to pass a full tow at one lockage. The lock at Sault Ste. Marie was 900 feet by 60 feet with 18 feet 3 inches depth of water on the sills at lowest known water level. Along this route the Lachine, Soulanges, Cornwall, Welland and Sault Ste. Marie canals were lighted throughout by electricity and electrically operated. The Farran's Point Canal was lighted by acetylene gas.[3] Though the Murray, Trent, Rideau and Ottawa canals could be considered geographically as branches of the through east-west route, yet the operation of these canals served mainly a distinct local traffic.[4] Two prominent waterways were isolated from the system just mentioned. The Richelieu River, flowing from Lake Champlain and joining the St. Lawrence at Sorel, was made navigable by means of the St. Ours lock and the Chambly Canal; while in the extreme east the St. Peters Canal provided communication between the Bras d'Or lakes of Cape Breton Island and the Atlantic Ocean.[5]

II

Since great difficulty was experienced in carrying on construction under war conditions, work on the Welland Ship Canal was discontinued in March 1917 and only resumed again two years later. As already noted the proposed ship canal left Lake Ontario at the mouth of Ten Mile Creek, about three miles east of Port Dalhousie, and followed an entirely new route from Lake Ontario as far as Allanburg, about half-way across the peninsula. From there it followed the old alignment to Port Robinson. Between Port Robinson and Welland a more direct route was taken than formerly, but beyond Welland to Port Colborne the old line was followed except at one place where a large bend was cut out. The old length of 26¾ miles would by these changes, by which objectionable bends were eliminated, be reduced to 25 miles and as the number of locks to be negotiated would be reduced materially, a great saving in the time of passage was anticipated. The difference in level between the two lakes, 325½ feet, was to be overcome by only seven locks, each having a lift of 46½ feet, in the new ship canal instead of 26 locks as in the old 14-foot canal.[6] In the old canal, with electrical equipment, it took usually from 20 to 30 minutes to pass a vessel through a lock and the time of passage from lake to lake was from 15 to 18 hours. Under favourable conditions lockages had been effected in eight minutes but this was uncommon. The new ship canal would have locks capable of being filled in 8 minutes and lockages would be effected, it was estimated, in less than 40 minutes for large vessels. The higher speed possible in the canal reaches combined with the smaller number of locks would reduce the time of passage to something like one-half of that common on the old canal. On the new ship canal, locks 1, 2, 3 and 7 were to be simple chamber structures. Locks 4, 5 and 6 were in twin flight. The double construction had been chosen to escarpment to expedite the passage of vessels, one flight used for upbound and one for downbound traffic. In addition to the set of lift locks, a set of guard locks was located on the summit to protect lock 7 on the edge of the escarpment and a guard lock 8, 1,380 feet long between gates and the longest lock in the world, was located near Port Colborne. The need for this lock arose from the fact that the Lake Erie level was subject to considerable fluctuation due to the wind. The average lift in the guard lock would be about 3 feet. The width of the ship canal prism was to be 200 feet. A new breakwater was to be built at Port Colborne extending 2,000 feet further into the lake than the existing breakwater. Extensive harbour works were contemplated for the Lake Ontario entrance at Port Weller.

For construction purposes the canal was divided into nine sections of contracts numbered from the Lake Ontario end.[7]

Section 1. Extended from Port Weller a distance of nearly 3 miles inland in a southerly direction.

Section 2. Approximately 4½ miles in length.

Section 3. Extended southerly from section 2 for a distance of about 2 miles.

Section 4. Extended about 2 miles from the end of section 3.

Section 5. Approximately 3¼ miles in length.

Section 6. Located between Port Robinson and Welland and slightly over 3½ miles in length.

Section 7. Approximately 4 miles in length and extended from the town of Welland to the northerly limit of the village of Humberstone.

Section 8. Approximately 3 miles in length and extended from the north end of the village of Humberstone to the deep water in Lake Erie.

Section 9. This section was located at Port Colborne.

Throughout the decade of the 1920s work progressed steadily on the construction of the new Welland Ship Canal. When finally completed the locks were 829 feet long between the inner gates and 80 feet wide and provided a depth of 30 feet of water on the mitre sills.[8] The width of the canal at bottom was 200 feet.[9] There was an available depth of 25 feet throughout the canal though 17 miles of the canal were dredged to 27 feet.[10] Lock 8 was placed in operation during the fall of 1929, and locks 1, 2, and 3 became operational with the opening of the 1930 navigation season.[11] The twin flight locks 4, 5 and 6, together with lock 7 and the gate guarding the summit level were completed during the fall of 1930.[12] The canal crossed the Niagara peninsula in an almost straight north-south line and was formally opened on 6 August 1932. Until the St. Lawrence canals were likewise enlarged, the effect of the new Welland Ship Canal was mainly to transfer the transhipment port from Port Colborne and Buffalo on Lake Erie to Prescott, which became the terminal on the Canadian shore of Lake Ontario, and Oswego on the United States side.[13]

Considerable landscaping was undertaken in connection with the new canal.[14] There was an extensive planting of trees and shrubs for the protection and ornamentation of canal banks and lock areas. In addition, there was a greenhouse erected at Port Weller for the cultivation of plants to be used for the beautification of the lock areas.

The completion of the St. Lawrence Seaway in 1959 meant an increased importance as well as new problems for the Welland Canal. It now served as a vital link enabling international shipping to pass through to the Great Lakes. However, this increased volume in shipping using the canal "necessitated 'twin-locking' of all its locks." By 1967 the volume had increased to such an extent that it became necessary to straighten certain sections of the canal. This work required the expropriation of land in order to construct a new canal around the city of Welland – an 8-mile channel east of the city which would eliminate six bridge crossings. Plans were made to construct a syphon culvert at Port Robinson to carry the river under the canal. Studies were also under way to find suitable terrain to reconstruct the entire Welland Canal by building four locks with a lift of 81 feet each. Work has been done immediately east of Thorold where certain parts of the old second and third canal lands have been converted into a scenic park area thereby "preserving some of the fine old stone locks for posterity."[15]

III

By the turn of the century the recent advancement of electrical science had given a new significance and importance to the waterpower possibilities of the St. Lawrence Waterway. Consideration was therefore given to the use of the water in the Soulanges section of the St. Lawrence River for the development and transmission of hydro-electric energy. This section of the river extends from the foot of Lake St. Thomas to the head of Lake St. Louis, a distance of 18 miles. The total fall in the section at main stage is 82.8 feet which, in the natural state of the river, was divided between the Coteau, Cedars, Split Rock and Cascades rapids. It has been previously noted that prior to 1914 the need for electrical power led to the construction of power projects on the Soulanges section. The oldest of these was the St. Timothée plant of the Canadian Light and Power Company with an installed capacity of 28,000 horsepower. This plant was brought into operation in 1911. It drew water from the abandoned Beauharnois Navigation Canal and operated under a head of about 50 feet. The Cedars Rapids plant of the Quebec Hydro-Electric Commission was the next one to be put into operation in 1914. This power house was located on the north shore of the river at the foot of the Cedars Rapids.

The largest power development in the Soulanges section was the Beauharnois Light, Heat and Power Company, owned and operated by the Quebec Hydro-Electric Commission. By various Acts of Parliament this company enjoyed the right to divert from Lake St. Francis, through a power canal located on the south shore of the river, such quantities of water as the Governor in Council should from time to time determine, "up to but not exceeding all the surplus water of the flow of the said river not required for navigation or for the use of other persons holding water power rights heretofore acquired."[16] Such water was returned to the river at the head of Lake St. Louis, north of the town of Beauharnois. In 1931, an Act of Parliament decided that the improvement of inland navigation by the development of a deep waterway required that the Beauharnois company's canal be made available for navigation purposes.[17] Thereupon the canal was declared to be a work for the general advantage of Canada.

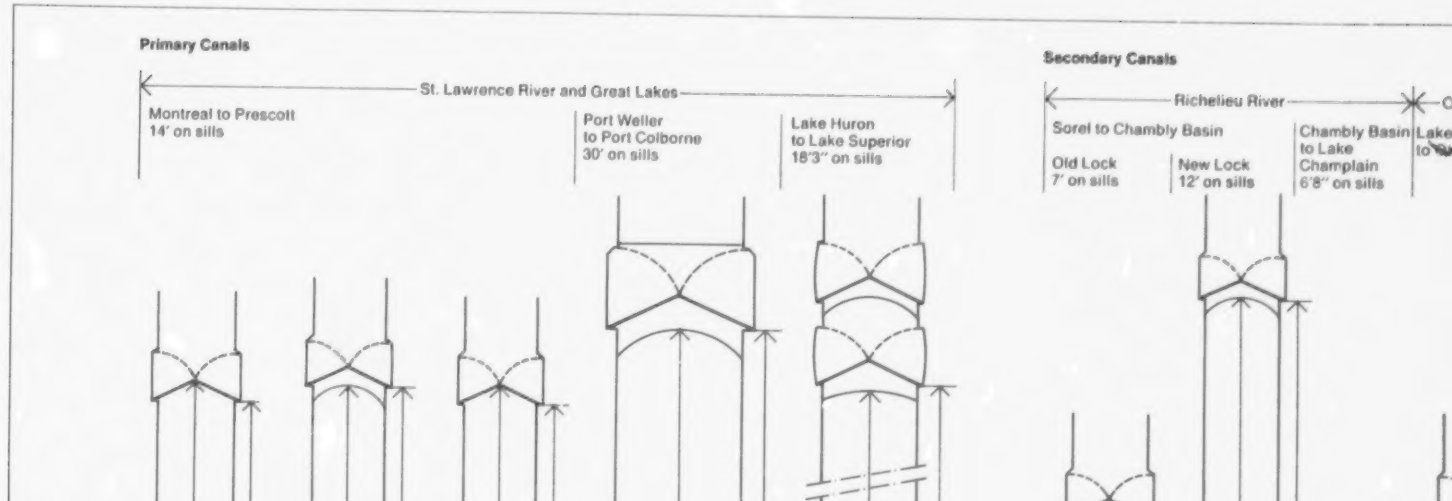
Construction of the Beauharnois project was commenced in 1929 and power was first developed in 1933. The power canal was 16 miles long flanked by embankments about 3,200 feet apart. The agreement with the government provided that the works "shall be located, constructed and operated by the Company in conformity with the requirement of the paramount rights and interests of navigation on the St. Lawrence River as determined by Order of the Governor in Council."[18] The power house was located on the shore of Lake St. Louis, operated under an average head of about 80 feet, and had an installed turbine capacity of 184,000 horsepower. However, the demand for power increased rapidly and continued to increase. Shortages of energy were experienced in Ontario, Quebec, New York and New England. The Beauharnois power house was extended in order to provide for the installation of an additional 600,000 horsepower.[19] Over the years Beauharnois has fully justified itself with its generating capacity being steadily enlarged.

To compensate for the diversion of water from the river, the Beauharnois Company dammed the river at two points. A series of dams in Coteau Rapids provided for the complete control of the levels of Lake St. Francis and dams at Ile Juillet in Cedars Rapids permit the regulation of the headwater level of the Cedars powerhouse and of the river above Cedars Rapids.[20] The Beauharnois development provided both the basis for a full development of power and a power canal that could serve navigation as part of the deep waterway.

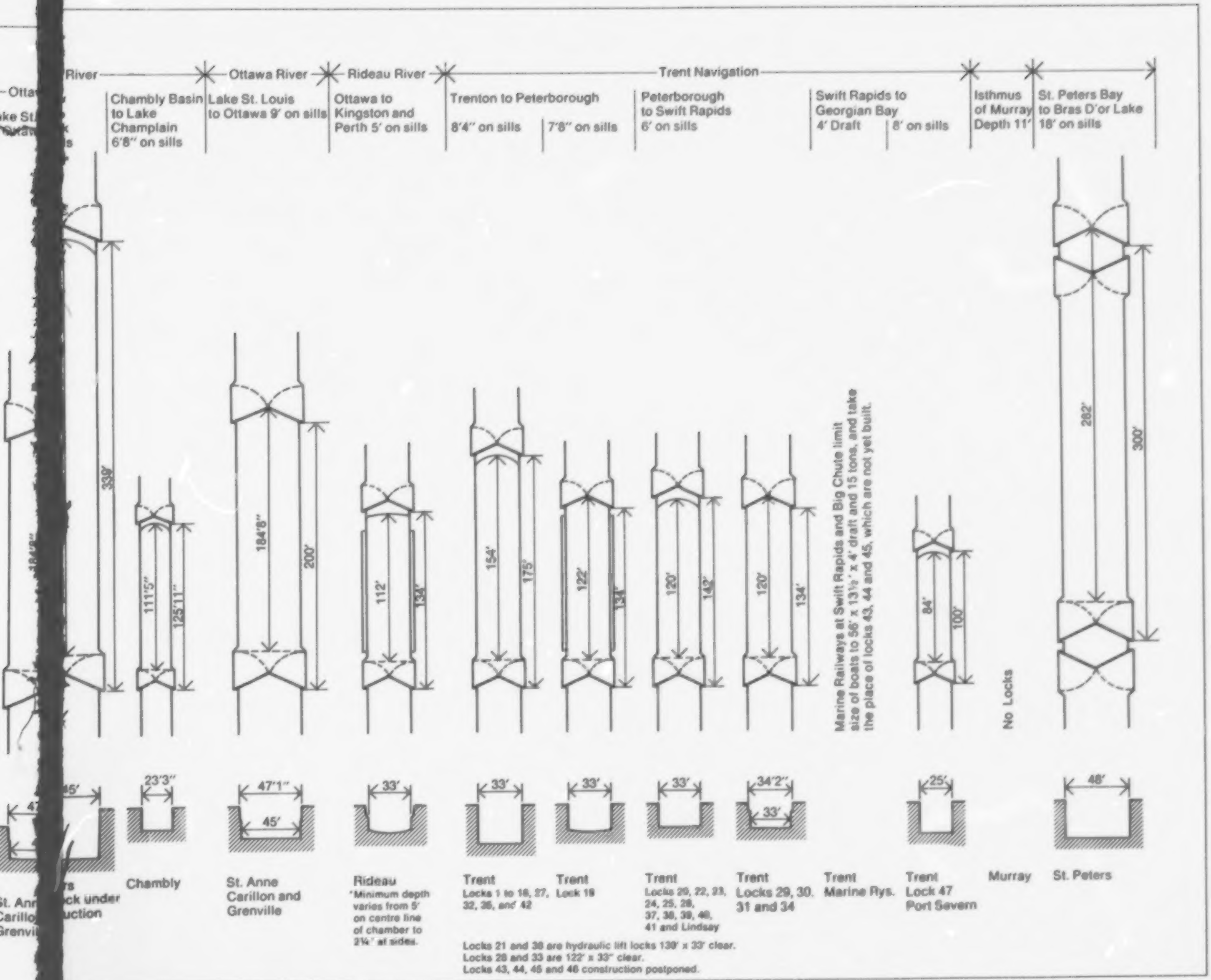
IV

Before discussing the enlargement of the entire St. Lawrence Waterway following World War I, let us consider briefly some of the improvements made to other waterways and canals after 1918. The completed Trent Canal system was opened in 1919 and the heaviest traffic recorded on it was for the year 1922 when the total lockages numbered 15,388.[21] The original scheme for the western division of this waterway, which extended from Lake Simcoe to Georgian Bay, and which included that portion of the route of the canal which lies between the navigable waters of Lakes Simcoe and Couchiching and Georgian Bay, provided for a lock and tunnels at Honey Harbour on Georgian Bay connected to Gloucester Pool via Go Home Bay and Lake.[22] This scheme, however, was not carried into effect. Instead, the navigation of

36 Plans and sections showing the dimensions of the smallest lock on each of the Canadian canal systems excluding superseded locks. (*The Canals of Canada* [under the jurisdiction of the Dept. of Railways and Canals], Ottawa, 1931.)

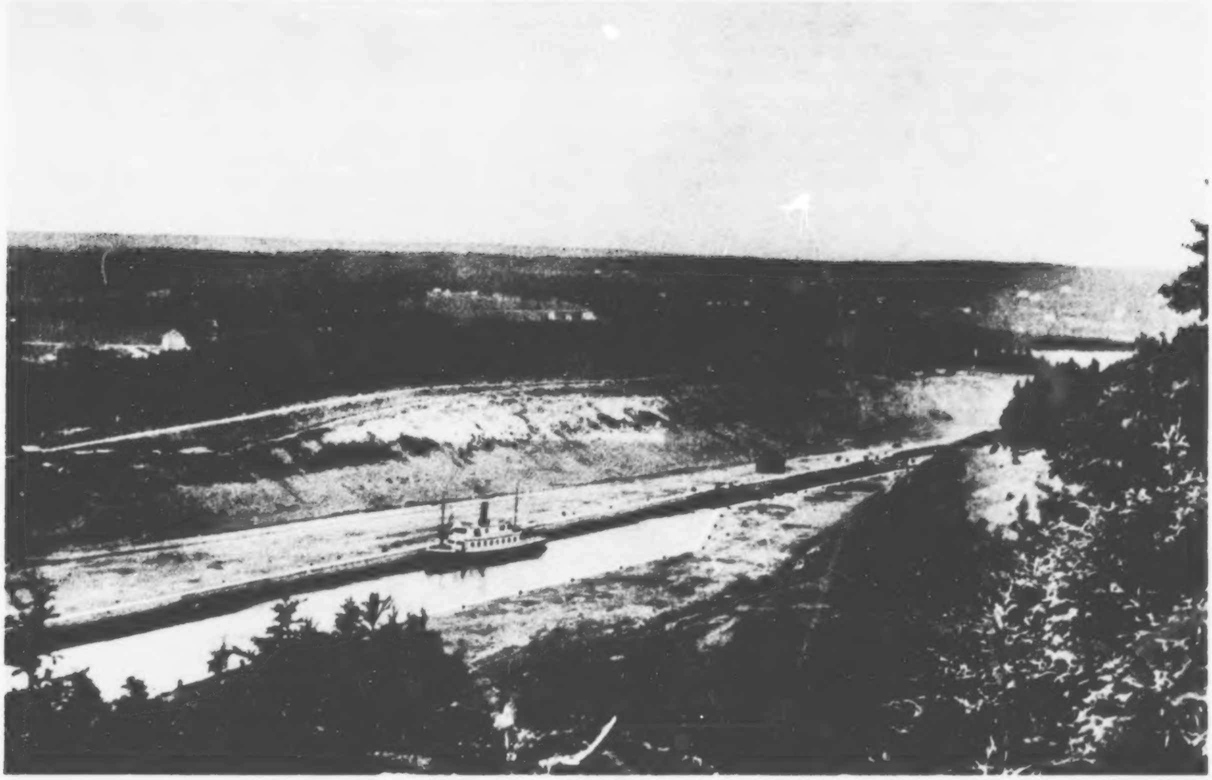


Slight shifting of masonry in some lock walls has somewhat narrowed the clear width of locks in certain spots.
Lock 17 on the Cornwall Canal is the most notable in this respect and is the limiting lock of the St. Lawrence system.


-Otta
River
Ottawa River
Rideau River
Trent Navigation
ake St
Chambly Basin to Lake Champlain 6'8" on sills
Lake St. Louis to Ottawa 9' on sills
Ottawa to Kingston and Perth 5' on sills
Trenton to Peterborough
8'4" on sills
7'8" on sills
Peterborough to Swift Rapids 6' on sills
Swift Rapids to Georgian Bay
4' Draft
8' on sills
Isthmus of Murray Depth 11'
St. Peters Bay to Bras D'or Lake 18' on sills
339'
111'5"
125'11"
184'8"
200'
112'
134'
154'
175'
122'
134'
120'
142'
120'
134'
Marine Railways at Swift Rapids and Big Chute limit size of boats to 56' x 13½' x 4' draft and 15 tons, and take the place of locks 43, 44 and 45, which are not yet built.
84'
100'
No Locks
282'
300'
47
45'
23'3"
47'1"
45'
33'
33'
33'
33'
34'2"
33'
25'
48'
St. Ann
Carillo
Grenvil
ck under
uction
Chambly
St. Anne Carillon and Grenville
Rideau
'Minimum depth varies from 5' on centre line of chamber to 2¼' at sides.
Trent
Locks 1 to 16, 27, 32, 35, and 42
Trent
Lock 19
Trent
Locks 20, 22, 23, 24, 25, 26, 37, 38, 39, 40, 41 and Lindsay
Trent
Locks 29, 30, 31 and 34
Trent
Marine Rys.
Trent
Lock 47
Port Severn
Murray
St. Peters

Locks 21 and 36 are hydraulic lift locks 139' x 33' clear.
Locks 28 and 33 are 122' x 33" clear.
Locks 43, 44, 45 and 46 construction postponed.

37 St. Peters Canal, Nova Scotia, connecting the Bras d'or Lakes with the Atlantic Ocean. (*Public Archives of Canada.*)



the western division was effected by means of a lock at Washago and Lake Couchiching; the two marine railways located at Swift Rapids and Big Chute on the Severn River which provided for the transportation of 15- to 20-ton boats of 13½ foot beam and a length of 55 feet and draught of 4 feet; and the small lock at Port Severn on Georgian Bay.[23]

The Trent Canal system could accommodate only vessels of very limited size. This was due to the small dimensions of the old lock at Buckhorn. This lock restricted the maximum size of vessels moving from Trenton to Swift Rapids on the Severn River or passing from Peterborough to Swift Rapids to one of 6 feet draft and 127 feet in length if the beam did not exceed 21 feet. Square-built scows of 31½ foot beam or less could be accommodated to a length of 110 feet only. A vessel passing from Lake Ontario to Peterborough was restricted in size to 8 feet draft and 162 feet in length if the beam did not exceed 21 feet. Square-built scows of 32½ foot beam or less could be accommodated to a length of 145 feet. At Port Severn the small lock could accommodate only vessels limited to 6 feet draft and 85 feet in length, if the length of the beam did not exceed 24 feet. Square-built scows of 24½ foot beams or less could be accommodated to a length of 75 feet only. At the same time the largest motor boat which could be passed over the marine railways at Swift Rapids and Big Chute on the Severn River was one of 56 feet in length, 13½ foot beam, 4 foot draft and weighing not more than 15 tons.[24]

Of the two inland waterways between Canada and the United States, the St. Lawrence Waterway and the Richelieu-Champlain Waterway, the second offers the shortest way between Montreal and New York via the Richelieu River, Lake Champlain and Hudson River, a total distance of 452 miles.[25] This waterway also connects with the Great Lakes via the Erie Canal. In 1918 the New York State Canal System, which constituted a major part of the Richelieu-Champlain Waterway to and from important centres in New York state, was improved. Whereupon Canadians became very concerned about improving their own section of the Richelieu-Champlain Waterway in order to facilitate trade along this international route. For this reason the Richelieu River was deepened to 12 feet in 1928-30 between Sorel and St. Ours and in 1930 the construction of a new lock at St. Ours was commenced on the same dimensions as those of the New York state canal system. When finally completed in 1933 this lock was 339 feet long and 45 feet wide with a depth of 12 feet over the sills. This was the period of the great depression which hit Canada's forest industries early. Lack of adequate transportation facilities on the Richelieu tended to aggravate the economic situation for those Canadian industries requiring cheap transportation. Hence we find that the pulp and paper industries of Ontario and Quebec, the Canadian Lumbermen's Association, the textile and chemical industries, interested boards of trade and chambers of commerce in the province of Quebec, all made strong representations to the Canadian government pointing out that though Canadian-American trade had increased enormously the total tonnage carried on the Richelieu had dropped from a maximum of 750,000 tons a year to less than 100,000 tons. It was pointed out that because of the depression, low-priced materials moving in either direction could not afford to pay high rail rates. Such goods should, therefore, be allowed to move freely by water between points in the Hudson and St. Lawrence rivers and tributaries. But this was becoming more difficult because of the old fashioned facilities in the Canadian portion of the route making for a very slow transit time between New York and Three Rivers of from 14 to 16 days. Moreover, the use of the route was further restricted by the scarcity of small vessels.

These representations from business interests were favourably received by the Canadian government. In June, 1930, the Department of Railways and Canals announced that it had been authorized to spend $600,000 for the construction of a new lock at St. Ours and that this work should be finished by the autumn of 1931. This lock would be similar to the one at Whitehall, New York, and it would have 12 feet of water on the sills. It was also announced that the Department of Public Works would dredge the river to a depth of 12 feet between Sorel and Champlain Basin, and that a joint committee of engineers from the Department of Railways and Canals and the Department of Public Works were to study the cost of obtaining a navigable draught of 12 feet between Chambly Basin and Lake Champlain which would include the construction of another canal at Chambly deeper than the existing one. It was clear to government and industry that the obsolete locks at Chambly and the shallow navigable depth of the Richelieu were hindering the efforts of Canadian industry and American enterprise in connection with the development of business and shipping between the important cities and towns of the Ottawa, St. Lawrence and Richelieu rivers, Lake

Champlain and the Hudson River. The Canadian government, therefore, was prepared to follow the example of the Americans in the standardizing of their portion of the Richelieu-Champlain Waterway.

The mid-1930s found the Canadian and United States governments instructing the International Joint Commission to investigate the advisability of a deeper waterway from Montreal through Lake Champlain to connect with the Hudson River. The International Joint Commission instructed the engineers designated by both governments to prepare a report to include estimates of the cost of a 27-foot ship channel (with a depth of 30 feet for all lock sills) via all proposed routes between the St. Lawrence River and the Hudson River, and also estimates for the cost of a 14-foot channel and a 12-foot channel on whatever route should be considered the most economical.

In its interim report, which appeared in 1937, the International Joint Commission declared

> *That it is pertinent to note that the Government of Canada may decide to deepen the Richelieu River to 12 feet throughout its length from the international boundary down to the St. Lawrence. If that should be done, it would only be necessary for the Government of the United States to carry out small dredging near Rouses Point in order to ensure a 12-foot navigation from the St. Lawrence to the Hudson by this route.*[26]

In 1938 the Canadian government undertook the construction of a control dam and completed its construction the same year at Fryer's Island on the Richelieu River, 8 miles below St. John, in order to regulate the water levels. In the following year, 1939, protection works on the river banks, in view of the operation of this dam, were commenced between Fryer's Island and Lake Champlain. All these works and the expropriations necessitated by the dam were suspended in 1940 due to war conditions.

The year 1943 marked the centenary of the Chambly Canal. Executives of many companies interested in the improvement of the Richelieu River planned a celebration to mark the occasion and seized the opportunity to stress the importance and urgency of the immediate completion of 12-foot navigation on the Richelieu River. By this time the United States had spent millions of dollars to provide 12-foot navigation on the entire American section of the route. Canada had spent one and a half million dollars for the same purpose on the Canadian section by dredging to 12 feet the channel between Sorel and St. Ours, rebuilding the St. Ours lock for 12-foot navigation and building a control dam at Fryer's Island. Canada also did some intermittent dredging to 12 feet in different sections of the river between St. Ours and the United States boundary. Yet a 66-mile incomplete section in Canadian territory continued to hinder Canadian international trade from obtaining any benefit from the millions of dollars spent in modernizing 386 miles of canals along this waterway.[27]

V

A word must now be said about the extreme easterly St. Peters Canal in Cape Breton. Improvement works, which were begun on this canal in 1912 and which consisted in the construction of a new lock and entrance at the Atlantic end of the canal, were finally completed in November, 1917. The new lock was 300 feet long, 48 feet wide with a depth of 18 feet of water on the sills at extreme low water. It was, therefore, 100 feet longer than the old lock and the new work was a vast improvement on the old canal. St. Peter's continued to be used largely in connection with coal shipments from Sydney and in the transportation of farm produce from Prince Edward Island to the interior of Cape Breton. Between 1,800 and 2,000 vessels a year continued to make use of the canal during the open season.[28]

VI

Prior to the construction of the St. Lawrence Seaway the canals on the St. Lawrence, as built, controlled the size of vessel that could traverse the through route and the limiting lock in this respect was lock No. 17 situated at Cornwall. This lock had the following dimensions: length between gates 270 feet; width at bottom 43 feet 8 inches; width at coping 45 feet 3 inches; depth of water over mitre sills 14 feet. It would accommodate vessels having the ordinary perpendicular and pointed bow and rounded stern up to an over-all length of 255 feet.[29]

The upper entrance of the Galops Canal, the last of the St. Lawrence canals, was 113 miles above Montreal. Five miles above this point the Lower Lakes Terminals, generally referred to as the Prescott Terminals, were situated. These terminals, completed in 1930, consisted mainly of a reinforced concrete elevator of 5.5 million bushels capacity equipped with the necessary facilities for the unloading and the storing of grain received from upper lake freighters and the forwarding of such grain either by St. Lawrence canal-sized vessels or by rail as required. The wharves at the terminals would accommodate vessels drawing up to 24 feet.[30]

With the opening of the Welland Ship Canal in 1932, along with the successive

American programs of deepening the navigation channels in the St. Marys River between Lakes Superior and Huron and in the St. Clair and Detroit rivers between Lakes Huron and Erie, as well as the opening of the large American MacArthur lock at Sault St. Marie in 1943, the existing navigation facilities provided, by the end of World War II, a 25-foot navigation throughout the Great Lakes from the Lakehead to Prescott, Ontario. The great fleet sailing the inland waters – some vessels capable of carrying 20,000- to 25,000-ton loads – provided the cheapest transportation in the world. But between Montreal and Lake Ontario the outmoded 14-foot canals with their small locks still constituted a bottleneck permitting only small vessels to pass which carried little more than 2,500 tons.[31]

VII

Agitation for the enlargement of the entire St. Lawrence Waterway originated in the United States immediately following World War I. The sudden expansion of grain shipment to Europe at that time taxed all transportation routes including the St. Lawrence River with its outmoded 14-foot canals. Official investigations were, therefore, undertaken by Canada and the United States regarding this matter. Actually the St. Lawrence Waterway and international power development had been the subject of discussions and negotiations between Canada and the United States from before the turn of the century. The first co-operative action of the two governments leading toward the seaway development may be said, however, to date from 1905, at which time a Joint International Waterways Commission was established to deal with all matters pertaining to international waters between the two countries.[32] In 1920 the feasibility of improving the St. Lawrence for deep-draft vessels was referred to the International Joint Commission by the two governments. The commission was asked to report on improvements necessary (1) for navigation interest alone, and (2) for the combination of a navigation and power interest "to obtain the greatest beneficial use of the waters of the river." A board of engineers was created to assist the commission by submitting plans for the development of a deep waterway together with an estimated cost thereof.

In December, 1921, the commission submitted a report recommending a treaty for a joint project from Montreal to Lake Erie to deepen the waterway, but no official action was taken to implement the recommendation.[33] Three years later, in 1924, President Coolidge appointed the St. Lawrence Commission under the chairmanship of Secretary Hoover to advise the United States on the economic feasibility of the proposed deep waterway. At the same time Canada appointed the National Advisory Committee to report to the Canadian government on the project. Thereupon a Joint Board of Engineers on the St. Lawrence waterway project, consisting of three Canadians and three Americans, was appointed to review the engineering report of 1921 and to consider certain further questions submitted to it. Late in 1926, after both completing its study of the proposed deep waterway and obtaining the views of the Joint Board of Engineers, the St. Lawrence Commission made its report. This favoured the immediate improvement of the St. Lawrence for navigation and power purposes provided a suitable agreement could be made with Canada for the joint undertaking.[34] The commission considered that the improvement of the St. Lawrence route for transportation would act as a relief measure for agriculture since an enlarged ship canal would reduce transportation costs to a vast agricultural area in the interior of the continent.[35]

But, though the interests of navigation on the St. Lawrence were considered paramount, the beneficial use of the flow of water for power generation received careful consideration. It was agreed that the improvement of the rapid sections of the river for the joint benefit of navigation and power afforded better navigation than could be secured by an improvement in the interests of navigation alone.[36] On 13 April 1927, the United States Department of State transmitted the conclusions of the St. Lawrence Commission to the Canadian government which in return asked for a short postponement of further discussion.[37] On 31 January 1928, the Canadian government transmitted its views on the waterway project to the Department of State. In this communication Canada made known the conditions under which it would be prepared to enter into negotiations for drafting a treaty for the development of the St. Lawrence. At the same time Canada indicated that her transportation problem differed sharply from the United States. For example, Canada's rail transportation facilities had been developed in advance of needs, her rail rates were generally lower than those in the United States which probably meant that an improved St. Lawrence navigation offered a greater reduction in transportation costs for United States shippers than for Canadian shippers; and "as the greater part of Canada's railway mileage is now owned and operated by the State, the St. Lawrence proposals, in

38 Construction of the Welland Canal, about 1927.
(*Public Archives of Canada.*)

so far as they may possibly affect the revenues of the railways, present considerations as to which Canada's point of view is necessarily somewhat different from that of the United States."[38] And there for a time the matter rested.

In 1932 Canada and the United States signed the St. Lawrence Deep Waterway Treaty which provided that the governments of the two countries would construct jointly all the works – power as well as navigation – the power facilities to be turned over on completion to an appropriate agency within each country.[39] Two years later this treaty was rejected by the United States Senate. In the years following 1932, engineers of the Department of Transport carefully examined the St. Lawrence River in the vicinity of Iroquois Point and designed a project for the improvement of the International Rapids Section called the "Controlled Single Stage Project." In 1938 attempts were made to negotiate a new treaty but without success.

The wartime need for power brought representatives of Canada and the United States together to re-open negotiations in January 1940. These negotiations led to the Great Lakes-St. Lawrence Basin Agreement of 1941, containing the same provisions as the St. Lawrence Deep Waterway Treaty of 1932, but it, too, failed to receive the ratification of the United States Congress.[40] At the same time a board of engineers representing the two countries concluded that the "Controlled Single Stage Project" was in their opinion "the best from an engineering and economic point of view, bearing in mind the requirements of navigation and power and the protection of down river interests."[41] Finally, after more than 11 years of uncertainty in this matter, Canada, on 4 November 1952, ended the Great Lakes-St. Lawrence Basin Agreement of 1941.[42]

On 3 January 1944, the Canadian Temporary Great Lakes-St. Lawrence Committee and the United States St. Lawrence Advisory Committee submitted a joint report to the President of the United States and the Prime Minister of Canada recommending that should the governments decide to proceed with the development the work ought to be undertaken in general accordance with the plan of the "Controlled Single Stage Project."[43] The main features of the "Controlled Single Stage Project" as included in the Annex to the Great Lakes-St. Lawrence Basin Agreement of 19 March 1941, were:

1. A control dam in the vicinity of Iroquois Point.

2. A dam in the Long Sault Rapids at the end of Barnhart Island and two powerhouses, one on either side of the international boundary at the foot of Barnhart Island.

3. A side canal, with one lock on the United States mainland to carry navigation around the control dam and a side canal, with one guard and two locks, on the United States mainland south of Barnhart Island to carry navigation from above the main Long Sault Dam to the river south of Cornwall Island. All locks to provide 30-foot depth of water on the mitre sills and to be of the general dimensions of those on the Welland Ship Canal. All navigation channels to be excavated to 27 feet depth.

4. Dykes, where necessary, on the United States and Canadian sides of the international boundary to retain the pool level above the Long Sault Dam.

5. Channel enlargement from the head of Galops Island to below Lotus Island designed to give a maximum velocity to the navigation channel south of Galops Island not exceeding four feet per second at any time.

6. Channel enlargement between Lotus Island and the control dam and from above Point Three Points to below Ogden Island designed to give a maximum mean velocity in any cross-section not exceeding two and one-quarter feet per second with the flow, and at the stage, to be permitted on the first of January of any year, under regulations of out-flow and levels of Lake Ontario.

7. The necessary railroad and highway modifications on either side of the international boundary.

8. The necessary works to permit the continuance of 14-foot navigation on the Canadian side around the control dam and from the pool above the Long Sault Dam to connect with the existing Cornwall Canal.

9. The rehabilitation of the towns of Iroquois and Morrisburg, Ontario.[44]

Following World War II, elaborate studies in transportation economics were made in relation to the proposed St. Lawrence Seaway. The expansionist forces inherent in the project were stressed as well as how much a deep waterway permitting end-to-end traffic to develop along it would mean to the Canadian national economy and hence to the national income.[45]

In 1951 Canada proposed that separate agencies be authorized to construct the power works on the St. Lawrence River on the understanding that Canada would thereupon complete a 27-foot waterway from Montreal to Lake Erie. This would involve building the two canals in the International Rapids Section of the river previously planned for the United States side as well as the other canals in the Canadian sections. It would also involve deepening the Welland Canal but not the channels linking the upper lakes, which had always been a United States responsibility.[46]

In December an agreement was reached between the federal government of Canada and the provincial government of Ontario concerning the international power development.[47] Under this agreement the Hydro-Electric Power Commission of Ontario was to undertake the development of power in the International Rapids Section along with a United States agency to be designated later. In the same month, December 1951, legislation was passed providing for the creation of a Crown company, the St. Lawrence Seaway Authority, to build and operate the Canadian canals.[48] Since any development of power in the International Rapids Section required the approval of the International Joint Commission, under the Boundary Waters Treaty of 1909, the Canadian and United States governments initiated, in an exchange of notes on 11 January 1952, the preparation of joint submissions to the commission.[49] On 30 June 1952, these submissions were made to the International Joint Commission, which issued an Order of Approval on 29 October 1952.[50] On the same day as the two countries made their submission they formally agreed to the new plan which set out in detail the whole Canadian undertaking. Canada made known her intention to go it alone in developing navigation facilities on the Canadian side of the St. Lawrence River between Montreal and Lake Erie and to provide for a 27-foot depth throughout the waterway.

On 15 July 1953, the United States Federal Power Commission issued a licence to the Power Authority of the State of New York to develop the United States share of the power. The licence was challenged in the United States courts but it was upheld by a unanimous decision of the Court of Appeals for the District of Columbia on 29 January 1954. The decision in turn was appealed to the United States Supreme Court which, on 7 June 1954, announced it would not entertain an appeal. The decision by the Supreme Court made American cooperation possible in the St. Lawrence Seaway project. Meanwhile the United States Congress enacted the Wiley-Dondero Act authorizing and directing the St. Lawrence Development Corporation to join the St. Lawrence Seaway Authority in constructing on United States territory all the navigation facilities necessary in the International Rapids Section of the river.[51]

The United States Supreme Court's decision of 7 June 1954 was an historic one for Canada and the United States for it erased any impediment to the construction of the St. Lawrence Seaway and power development. In May 1954 Congress passed and the President approved legislation creating a St. Lawrence Seaway Development Corporation "and ordered it to construct the two United States canals in the International Rapids Section of the St. Lawrence River as part of the Seaway system."[52]

Meanwhile during July and August discussions took place in Ottawa between Canadian and American representatives leading to modifications of the agreement of 30 June 1952. Canada now agreed to give up "its undertaking to build one of its canals on the International section near Cornwall and at the same time declaring its intention to proceed with the construction of a canal at Iroquois."[53] In September the St. Lawrence Seaway Authority followed by the United States St. Lawrence Seaway Development Corporation called for the first tenders for construction of the navigation works. This construction began before the end of the 1954 season.

The following is a brief description of the navigation picture of the St. Lawrence-Great Lakes Waterway in 1954 when work commenced on the seaway:

a. From the Gulf of St. Lawrence to Montreal, a distance of about 1,000 miles, controlling navigation channels were 35 feet in depth.

b. From Montreal to a location 4 miles below Prescott, Ontario, controlling navigation channels were 14 feet in depth.

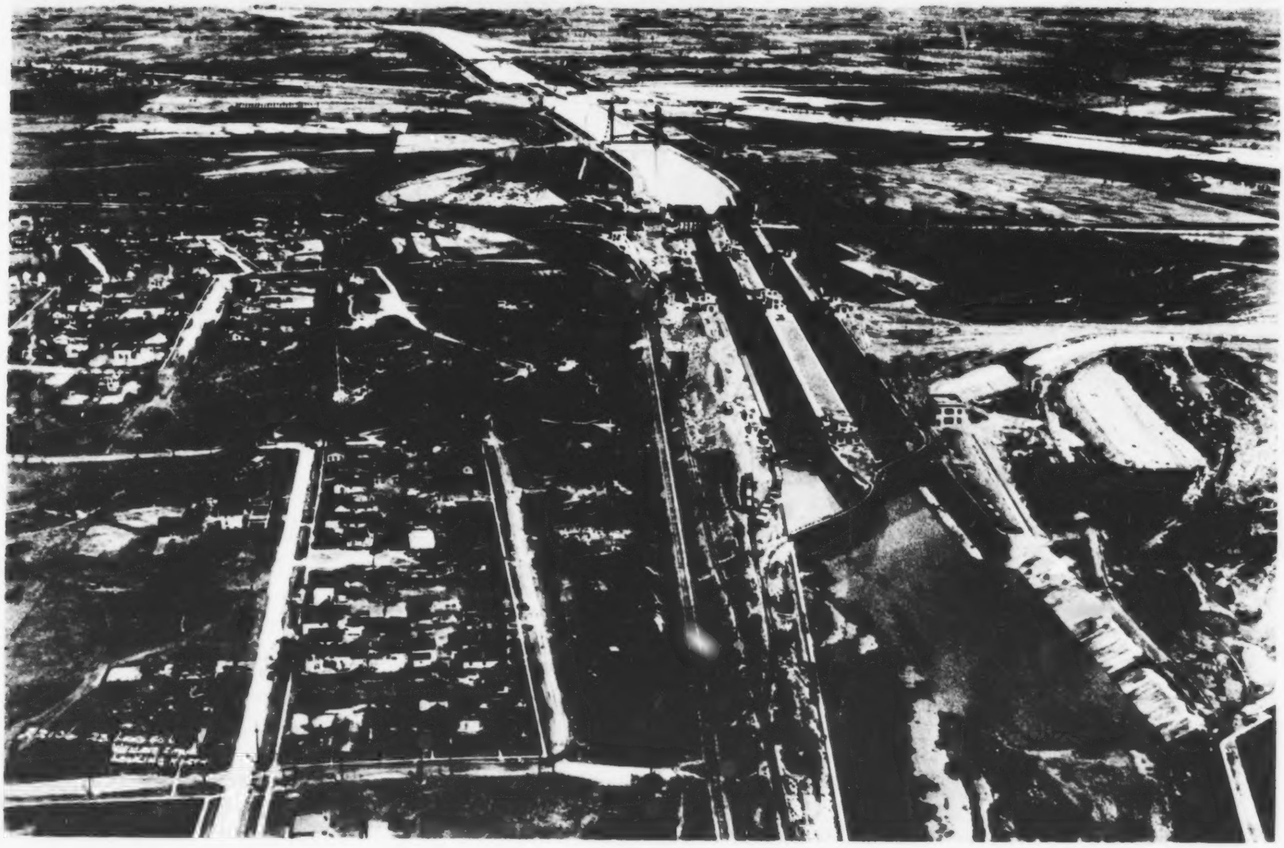
c. From just below Prescott, Ontario, through Lake Ontario and the Welland Canal to Lake Erie, controlling navigation channels were 25 feet in depth.

d. From Lake Erie to the head of the lakes, a distance of 70 miles, controlling navigation channels were 25 feet deep in the downbound channel and 21 feet deep in the upbound channel.

Basically the seaway plan was designed to break the bottleneck formed by the 114-mile international section of the St. Lawrence River navigable only through a chain of outmoded 14-foot canals capable of handling ships with a maximum capacity of but 3,000 tons. The seaway would thus extend deep-sea facilities into the heart of industrial North America.[54] But there was another more compelling reason for the construction of the seaway. According to Mr. Pierre Camu, president of the St. Lawrence Seaway Authority, "The major benefit of the Seaway contrary to public opinion, was not to open the Great Lakes to ocean shipping – although this was indeed an important factor – but to free the lakers for service into lower St. Lawrence River ports."[55]

The St. Lawrence River above Montreal divided naturally into five sections:

39 Aerial view of Locks 4, 5 and 6 of the Welland Canal looking north, taken before the canal was finished in 1932. (*Public Archives of Canada.*)



the Thousand Islands section, the International section, the Lake St. Francis section, the Soulanges section and the Lachine section. One might also add to these a sixth section – from the Welland Canal to Lake Erie. In three of these sections major works were required. The International Rapids section was to be the location of the major works; there the hydro-power installations were undertaken jointly by the Hydro-Electric Power Commission of Ontario and the Power Authority of the State of New York. Construction here consisted of (1) a dam in the Long Sault Rapids and two power houses a short distance below the rapids, one on the Canadian side and one on the American side, each capable of developing 1,100,000 horsepower; (2) a control dam near Iroquois Point to control the level of the pool and to protect the down-river interests of Montreal; (3) side canals on the United States mainland to carry navigation around the Long Sault dam and a side canal on the Canadian side to circumnavigate the control dam at Iroquois, and (4) dykes where necessary in order to raise the average elevation along the front from Cornwall to Prescott from 220 feet above sea level to between 238 and 242 feet. The St. Lawrence Seaway Authority undertook to construct a canal and lock at Iroquois required to by-pass the control dam.[56]

In the Soulanges section the existing canal for the Beauharnois Quebec power development incorporated a 27-foot navigation channel along one side. Work to be done here included the construction of two locks separated by a three-quarter mile intermediate pool and three bridges.[57]

The Lachine section was the most costly and most complicated part of the whole seaway in Canadian territory. Here was to be built an 11-mile canal with considerable channel enlargement extending from above Caughnawaga in Lake St. Louis to the entrance of Montreal Harbour. Two locks were to be built, one at St. Lambert near Victoria Bridge and the other at Côte Ste. Catherine opposite the Lachine Rapids. Three turning basins were to be constructed, one in Montreal Harbour and two in Laprairie Basin, to permit the free movement of ships. It was held that a combined development for power and navigation was possible in the Lachine section but it was decided that for the present the plan would be for navigation only.[58]

In the remaining two sections, Lake St. Francis and Thousand Islands, only comparatively minor channel dredging was required. Within the Great Lakes area the Welland Canal was to be deepened to 27 feet while, in order to reach the standards laid down for the completed seaway, considerable dredging needed to be done in the St. Clair-Detroit passage into Lake Huron and in the St. Marys River to Lake Superior.[59]

VIII

The major part of the construction of the St. Lawrence Seaway was completed by April 1959. The Welland, Cornwall, Lachine and Sault Ste. Marie canals were then transferred from the Department of Transport to the St. Lawrence Seaway Authority for operation and maintenance in accordance with Order in Council P.C. 1957-204, effective 1 April 1957. A deep-water channel now connected the Great Lakes and the sea. Whereas previously six canals and twenty-two locks were required to raise shipping to the level of Lake Ontario during the passage from Montreal, now four canals and seven large locks, two of them in the United States, sufficed to do the job. The locks in the new seaway measured 859 feet by 80 feet and had a depth of 30 feet.[60] A channel dredged to a depth of 27 feet allowed ships with a draught of almost 26 feet to make the complete passage from the ocean to the Great Lakes.[61] The complicated system of hydraulics worked out for the seaway allowed for the regulation of a flow of water through the canals by means of a network of dams and weirs. This system operated to prevent flooding, to maintain power and navigation levels, and to provide sufficient quantities of water for power generation, municipal water supplies and other leased water rights.[62]

To understand better the navigation route of the seaway it might be useful to trace briefly the passage of a ship through it. Upbound from Montreal, the ship first enters the St. Lambert Lock, at the southern end of Victoria Bridge, which lifts the ship some 15 feet from the level of Montreal Harbour to the level of Laprairie Basin in an 8½-mile-long channel. Next the Côte Ste. Catherine Lock lifts the ship 30 feet from the level of Laprairie Basin to the level of Lake St. Louis. The ship bypasses the Lachine Rapids on the other side of which the channel extends 7½ miles before reaching Lake St. Louis. The Lower Beauharnois Lock at the west end of Lake St. Louis allows the bypassing of the Beauharnois Power House and lifts the ship 41 feet, enabling it to pass through a short canal to the Upper Beauharnois Lock where again it is lifted 41 feet to reach the level of Lake St. Francis. Following a passage of roughly 13 miles in the Beauharnois Canal the ship enters Lake St. Francis. Continuing to move westward the ship then passes through two United States locks; the Snell Lock lifts the ship 45 feet into the Wiley-Dondero Canal (10 miles long) and the Eisenhower Lock lifts it another 33 feet into Lake St. Lawrence. At the western end of this lake is the Canadian-built Iroquois Lock to allow the ship to bypass the Iroquois Central Dam. The ship then navigates the channel through the Thousand Islands to Lake Ontario.

As of 31 December 1959, contracts awarded for construction work and for lock machinery and equipment totalled approximately $274,852,500.[63] This capital expenditure was financed by loans to the Seaway Authority from the Canadian government. Interest rates charged by the Department of Finance varied, being influenced by the cost of government borrowings. The St. Lawrence Seaway Authority Act required "That there be established a tariff of tolls under which there would be recovered the expenditure by Canada for Seaway operation and maintenance, interest and amortization of capital within a 50-year period."[64] During the first year of operation the volume of traffic making use of the new facilities provided by the seaway between Montreal and Lake Ontario totalled 20,590,000 tons, representing an increase of 75 per cent or 8,830,000 tons as compared with the traffic carried by the 14-foot canals during the year 1958.[65] At the same time traffic on the Welland totalled 27,530,000 tons, an increase of 6,260,000 tons or 29 per cent over the 1958 season.[66] In 1964, 4,998 ships carrying more than 21,402,000 tons of cargo moved upbound through the seaway and 5,038 vessels carrying 34,377,000 tons moved downbound.[67] Ocean-going ships carried 19.1 per cent of the total cargoes; lakes ships carried 80.8 per cent, and other craft carried one per cent.[68] There was still, however, an imbalance of loading with 38.9 per cent of the gross registered tonnage of all vessels upbound being in ballast compared with only 12.8 per cent of the vessels downbound.[69] Of the total tonnage carried upbound in 1964, 18,111,000 tons were domestic cargo and 3,291,000 tons were foreign traffic; downbound 27,310,000 tons were domestic freight and 7,066,000 tons were foreign.[70]

As previously noted, the International Rapids Section of the seaway is the site of the St. Lawrence Power Project which was undertaken jointly by the Hydro-Electric Power Commission of Ontario and the Power Authority of the State of New York. The construction of the seaway and the harnessing of the St. Lawrence for the expansion of hydro-electric power, therefore, are the concerns of different authorities both in Canada and the United States. However, the two projects, navigation and power, are integral. They were undertaken at the same time. The power pool for the electric generators provides the necessary depth of water for navigation. The power pool was formed by damming the river just above Cornwall to form the new artificial St. Lawrence Lake which is 28 miles long and has a maximum breadth of about 4 miles. This lake came into existence on 1 July 1958 when the area above the newly constructed 145-foot high Long Sault Dam and the power dam was allowed to flood.[71]

Stretched between Barnhart Island and the Canadian mainland and standing squarely across the international boundary is "the 3,300 foot long power dam surmounted by its 32 generating units." Sixteen of these units are in Canada and sixteen in the United States while "the 2.2 million horsepower is divided equally between the two countries."[72]

Thus the development of the natural Great Lakes-St. Lawrence water system into a superb water highway and source of much needed electrical power has been achieved and has become a vital integral part in the economy of both the United States and Canada.

The St. Lawrence Seaway represents a successful venture in international co-operation. The planning, designing and building of it presented challenging problems in technique, organization and management. It seems probable that in the near future an increasing pressure of population in the Great Lakes area will necessitate further Canadian-American co-operation in establishing the part of the continent as "a natural planning area."[73] Such co-operation might lead to the possible integration of present and future canals, in the area of the Great Lakes basin, to form international waterways.

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65 In 1826 a company was incorporated to build this canal which was opened to traffic in 1837. Extending from Burlington Bay to Dundas, it was just over 3½ miles long, 33 feet wide, and navigable for vessels drawing up to 7½ feet of water.

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The military records in the Public Archives of Canada commonly known as the "C" series provide indispensable source material for any study of the origins and construction of the early canals along the St. Lawrence, Ottawa and Rideau rivers. Consisting largely of official correspondence carried on by officers of the Royal Engineers, the material illustrates some of the problems encountered in construction and some of the administrative difficulties which arose. It also indicates the methods used in financing construction, in awarding contracts prepared by the Commissariat Department at Quebec, and the difficulty often encountered in acquiring land through which to build the waterway.

Another important source of information found in the Public Archives on the subject of early canals is the series CO42. This series consists of the official correspondence and enclosures from the governors, lieutenant governors and administrators of Quebec, Lower Canada, Upper Canada and the United Province of Canada. Here one finds information on a wide range of subjects concerning the colony, including canals and inland waterways. Other pertinent series of records in the Public Archives are WO1 in which volumes 561 and 567 contain material relating to the transfer of the Rideau and Ottawa canals to the provincial government, and Admiralty Supplementary 4 which relates to the proposed Grand River Canal, 1820-1824.

Papers on subjects connected with the duties of the Corps of Royal Engineers provide good material relating to the construction of a few canals. Volumes 1 to 4 contain information on the Rideau Canal indicating why it was constructed; the size and construction of the locks, gates, dams, preliminary arrangements and commencement of work; advantages obtained by the use of locks and dams; state of the work at various times; detailed description of the works along the entire line; prices of work and materials; rates of pay to mechanics, expense of undertaking; military and commercial usefulness of the canal, and the tolls collected. Volume 5 includes Lieutenant Colonel George Phillpotts' celebrated and informative *Report on the Canal Navigation of the Canadas*. Volume 8 contains an important document relating to the projected Baie Verte canal: *Report on a Survey of a Line for a Canal to unite the Bay of Fundy with the Gulf of Saint Lawrence in 1842*, by Captain Crawley R. E. This volume also provides a reliable index to the first seven volumes.

The provincial statutes of Upper and Lower Canada and the journals of the assemblies of the two provinces contain the legislation pertaining to inland navigation and indicate the petitions received, the resolutions and bills introduced on the subject of canals, and the committees formed to discuss and consider the construction of waterways. Especially useful are the appendices to the journals which contain the reports of select committees on canals along with engineers' survey reports on specific routes.

In 1838 the imperial government authorized Lord Durham, shortly after his arrival in Canada, to have a survey of the whole water route from Lake Erie to tidewater made by a competent engineer. Durham selected for the job Lieutenant Colonel George Phillpotts of the Royal Engineers and formerly chief engineer of the Cornwall Canal. Phillpotts' reports of 31 December 1839 and 3 August 1840 on the inland navigation of the Canadas are among the most valuable documents ever prepared on Canadian canals, providing as they do a wealth of information on the subject. In them Phillpotts presented a detailed study of the military, economic and social importance of the waterways for a viable Canadian community.

Following the union of the Provinces of Upper and Lower Canada in 1841, all canals other than the ordnance canals on the Ottawa and Rideau rivers were placed under the control of the Board of Works. The ordnance canals (Carillon, Chute-à-Blondeau, Grenville and Rideau), constructed by the imperial government and managed by imperial authority, were not transferred to the Canadian government until 1856. In the following year they were placed under the control of the Department of Public Works. The annual reports of the department are a useful source and especially so is the report of 1867, the last one issued by the old Province of Canada, containing a wealth of information on all aspects of Canadian canals in the pre-confederation period. Throughout the period of union, 1841-1867, the provincial statutes of Canada and the journals of the legislative assembly of Canada and appendices contain legislation and valuable reports on canals and inland waterways. Equally deserving of mention are the Merritt papers in the Public Archives which abound in manuscript material relating to canals and to the Welland Canal in particular and which extend over the first half of the 19th century. Finally one cannot conclude a brief treatment of source material on canals before 1867 without mentioning the ever useful H. A. Innis and A. R. M. Lower, *Select Documents in Canadian Economic History, 1783-1885*, and G. M. Craig, *Early Travellers in the Canadas, 1791-1867*.

Following confederation an "Act respecting the Public Works of Canada" (31 Vic., C. 12) placed under the control of the Minister of Public Works all the canals and their works on navigable rivers constructed by the provincial governments previous to 1 July 1867. This Act remained in force until 1879. In that year the Department of Public Works was divided into two departments. Section 4 of "An Act respecting the offices of Receiver General and Minister of Public Works" (42 Vic., C. 7) stated that "the present Department of Public Works shall be divided into two departments, to be presided over and managed by two Ministers, one of these said Ministers shall be designated as Minister of Railways and Canals and the other as Minister of Public Works." Section 5 went on to state that "the Minister of Railways and Canals shall have the management, charge and direction of railways . . . and of all canals and works and property appertaining or incident thereto." From this time on the department's annual reports provided information relating to construction, enlargement, improvement, traffic, expenses and revenues of all canals.

Disturbed by the inadequate performance of the St. Lawrence route in relation to western trade, the Canadian government in 1870 appointed a Canal Commission respecting the inland navigation of the Dominion of Canada. The commission's report appeared the following year and ranks with Phillpotts' reports as one of the most informative statements ever made on the subject. This detailed study of Canadian inland navigation depicts the crucial role such navigation must play in the newly formed confederation.

In 1903, the Canadian government, realizing that the shipment of western grain was the most urgent transportation problem of the day, set up a Royal Commission on Transportation. The commission considered every possible artery by which the products of the West could reach ocean navigation. Its report in 1905 is another of the key documents relating to the crucial role of canals in the transportation facilities of Canada.

One further source of information deserves mention. The pamphlet collection of the Public Archives contains an abundance of contemporary material relating to canals (*see Catalogue of Pamphlets in the Public Archives of Canada, 1497-1932* [Ottawa, King's Printer, 1931-32], 2 vols.). This material consists of survey reports of engineers; reports, plans, surveys and correspondence ordered by the legislative assemblies of Upper and Lower Canada; reports of select committees of the legislative assemblies on canals; speeches on the subject of canals delivered in the House of Commons; series of pamphlets issued in furtherance of a specific project, and reports of surveys and estimates of costs of specific projects made by the Department of Public Works. As one would expect, these pamphlets are of uneven quality but they provide useful source material.

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